Public Health Reports

Vol. 56 • AUGUST 1, 1941 • No. 31

PERTUSSIS PROPHYLAXIS WITH TWO DOSES OF ALUM-PRECIPITATED VACCINE [1]

By JOSEPH A. BELL, *Passed Assistant Surgeon, United States Public Health Service*

A single dose of an alum-precipitated pertussis vaccine was given preliminary clinical trial in 1936–37 in Cumberland, Md. (*1*). This small trial indicated that the vaccine produced no undue immediate reactions but suggested that even though some protection appeared to follow its use, the protection might not be sufficient to justify its public health use. The results were considered promising enough to warrant further investigation. Accordingly, in April 1938, the United States Public Health Service, in cooperation with the Norfolk City Union of King's Daughters Visiting Nurse Association in Norfolk, Va., began epidemiological studies on the public health aspects of the prophylactic use of two doses of alum-precipitated pertussis vaccine. It was considered that if two doses of the vaccine, given with a 4-week interval between doses, caused no undue immediate reactions and produced sufficient protective immunization, the two doses might be combined with alum-precipitated diphtheria toxoid and be generally acceptable for public health use.

This report on these studies is concerned exclusively with the single question as to whether the vaccine confers any real protection against pertussis. Other questions as to the amount, nature, promptness, and duration of such protection, and the suitability of the vaccine for general or special use, are important but subsidiary. They are to be treated in future reports and are omitted from this report.

The vaccine used in the present studies is identical with that used in the first study; it was originated at the National Institute of Health by Senior Surgeon Walter T. Harrison and, in brief, was prepared as follows: Each cubic centimeter represented a saline suspension of 10 billion unwashed pertussis bacilli and their products, killed with 0.5 percent phenol [2] and precipitated by the addition of 0.027 cc. of

[1] From the Division of Infectious Diseases and the Office of Cooperative Studies, National Institute of Health.

[2] This original bacterial suspension in 0.6 percent saline was Parke Davis pertussis vaccine, prepared according to the method of Dr. L. W. Sauer from strains of *Hemophilus pertussis* recently isolated from typical cases of pertussis and agglutinating to high titer in antiserum produced with other recently isolated smooth (phase I) strains. The cultures were grown on human blood potato agar for 48 hours at 37° C.

10 percent sodium bicarbonate solution and 0.25 cc. of 4 percent potassium alum solution; after washing the precipitate once in 0.85 percent saline, it was suspended in 1 cc. of 0.85 percent sodium chloride solution containing 1:7,500 merthiolate.

The method of administration was similar to that commonly used for two-dose alum-precipitated diphtheria toxoid. One cubic centimeter was injected subcutaneously into the deltoid region of one arm of very young children and after a 4-week interval a similar dose was injected into the other arm.[3] Vials were thoroughly shaken to secure an even suspension just before each injection. It is noteworthy that the total amount of vaccine here injected represented only 20 billion organisms, whereas 80 to 120 billion organisms have been commonly recommended for prophylactic pertussis immunizations.

The single question to be answered by this report is whether the vaccine confers any real protection against the disease. Since the public health aspect of the disease is of chief concern, it was necessary that the observed children be representative of the general population. To answer the question it was necessary to have a clinical-epidemiological arrangement whereby a large group of children injected with the vaccine could be uniformly observed together with a group of children not injected with the vaccine but otherwise identical in all attributes which might influence the results. Three major problems were immediately evident: (1) The obtaining of an injected group identical in such attributes with a noninjected group; (2) the uniform observation of injected and noninjected groups over a period of time long enough to give an adequate experience of pertussis; and (3) the definition of pertussis as a clinical entity which, within the limits of observation available, could be uniformly and readily recognized in the injected and noninjected groups.

The first problem was that of locating for observation a group of children to be vaccinated, identical, in all attributes which might influence the occurrence and recognition of pertussis, with another

[3] The local and general reactions to injection of the vaccine appeared to be similar to those usually encountered in the immunization of children with alum-precipitated diphtheria toxoid. Comparatively few children had any noticeable reaction whatsoever. Some children were fretful and had a slight rise in body temperature during the first 24–48 hours following injection. The firm nodule developing after the injection of the precipitate was seldom noticed by the parents. When the vaccine was injected into the deltoid muscle, some pain was manifest on arm movement during the first 1–4 days. On the other hand, when the vaccine was injected too superficially there seemed to be a tendency for the nodule to remain soft and in a very few instances to rupture through the skin. In such cases the contents discharged were sterile, no infection occurred, and the condition was accompanied by no appreciable pain or tenderness, and by no enlargement of the lymph glands, or fever. This superficial injection of the vaccine was observed almost exclusively in the first group of children injected by two physicians whose early technique for injection consisted of inserting the needle almost parallel to the arm into a loose fold of skin picked up by the fingers of the left hand. It seems that the better technique is to grasp the arm from below with the left hand, draw the tissues tense over the deltoid muscle and insert the needle at an angle of about 15°, so that the vaccine will be deposited in the loose subcutaneous tissue.

group to receive no vaccine. It is impossible to select such identical groups because many of the attributes involved are not known, and many of those that are known cannot be quantitatively assessed; and, furthermore, even if such attributes could be made identical in the two groups at any one moment, they would not remain identical throughout the time necessary for adequate observation. Some attributes without apparent influence on the results may under certain circumstances be of real importance.

The only practical approach appeared to rest in the selection of two groups, each of which is a random sample of the combined groups in the exact sense of the term. Thus only can the prediction be made that should the vaccine have no real influence on the occurrence of pertussis, the occurrence in each group will approximate that of the combined group, deviating therefrom strictly within the range of chance sampling variation. On the other hand, if the vaccine confers real protection against the disease, or otherwise really influences its occurrence, the occurrence in each group will differ from that of the combined group outside the range of chance sampling variation. Obviously it is not practically possible to preselect two large strictly random groups of children who are representative of the general population and to insure that every child in one group receives the vaccine while every child in the other group receives no vaccine during the observation period. Children in the general population have the prerogative to refuse vaccine offered and the liberty to obtain other vaccine when desired. In these premises there is no known way of changing the two groups so that one would include only children actually vaccinated, and the other include only children not vaccinated, without destroying the randomness of the selection and to that extent possibly invalidating the answer to the question asked. After it has been established that the vaccine confers protection, then questions concerning the amount and duration of such protection might in part demand direct comparison of the experience of the children actually vaccinated with those not vaccinated, providing adequate data are at hand to equalize the two groups with respect to attributes which apparently influence the occurrence of the disease.

For this report, the approach to the primary problem involved the preselection of two large strictly random groups of children and the subsequent injection of a large proportion of only one group with the vaccine. All analyses herein presented are a comparison of the experience of such preselected groups regardless of their actual status with respect to receiving the vaccine. The difficulties encountered in this approach are chronologically described in detail so that the reader may evaluate any possible errors involved.

During March, April, and May, 1938, a public health nurse transcribed the names of children born between May 1, 1935, and March

31, 1938, who were on the various rolls of the King's Daughters Visiting Nurse Association. All of the names were not transcribed. Children whose records indicated that they had had prior whooping cough, children who were known to have left the city permanently, and a few of the children of well-to-do parents who, the nurse thought, were subject to pertussis vaccination apart from that given in the course of this study, were not transcribed.

The city of Norfolk, adjacent suburbs, and South Norfolk were divided into 14 geographic sections. The definition of boundaries of each section was the result of an endeavor to group people somewhat according to their usual association in schools, churches, theaters, and shopping districts. The children in each section are either white or colored, no one section having both.

A total of 1,954 names was transcribed, together with information as to sex, birth date, and address of residence, as recorded on the rolls from which they were copied. The names were transcribed in 14 groups according to geographic section of residence. In each group the names were listed in alphabetical order for each year of birth and the years of birth were ordered chronologically. A numbering machine was used to stamp a serial number after each name in the above order. Using the "Random Sampling Numbers" as assembled and published by L. H. C. Tippett (*2*), the allotted numbers in each section were divided at random into two equal groups hereinafter designated as the "V" and "N" groups.

Since there was an epidemic of pertussis in Norfolk during the spring and early summer of 1938, an effort was made to have the children selected in the "V" group injected with vaccine at an early date. Hence a search to locate the children selected in the "V" group and get consent for their injection with pertussis vaccine was made in April and May 1938, whereas no search for the "N" group was made until July. The vaccine was offered only to the "V" group and not to the "N" group or to other children. There were very few refusals even though no promises were made as to the effectiveness of the vaccine. Parents giving consent for vaccination were mailed an appointment card to bring the "V" child to a health station for his first dose of vaccine on May 23–25, 1938. The second dose was given 4 weeks later, in a similar manner. Certain "V" children who did not keep their appointments, and others who were ill, or who were temporarily out of the city, or who were not located as of those dates, were offered vaccine at later dates. Eighty-eight percent of the "V" children who received vaccine had their first dose prior to July 3, and practically all the vaccinations accomplished were completed before the end of September 1938.

During the early period of observation when visiting records of all children located were being checked, 129 selected children were found

whose names had been transcribed from several rolls and hence each had been assigned two or more numbers, often being selected in both the "V" and "N" groups. Thus a supplementary sampling process was necessary to allocate these children into either the "V" or "N" group in a strictly random manner. To this end the lowest of the numbers assigned to any child became his final number and designated his selected status in either the "V" or the "N" group. Of the 129 children, all numbers of 61 were either in the "V" or in the "N" group and hence their selected status remained unchanged. Of the remainder, 38 were assigned to the "N" group, including 21 who previously received vaccine, and 30 were assigned to the "V" group, of whom 21 subsequently received vaccine.

The above description of the first problem sets forth the practical difficulties encountered in this effort to preselect the names of a large number of children in two strictly random groups, locate the children represented by those names, eliminate the duplicates, secure two groups suitable for adequate observation, and insure that a large proportion of one group receive alum-precipitated pertussis vaccine prophylactically, while a large proportion of the other group receive no vaccine. Table 1 reveals the result of this effort. It is noted that the two groups completely observed are not equal in number, even though they were originally so selected. The search for the children in each group was pursued with equal diligence and all available evidence is consistent with the belief that the smaller size of the "N" group of children observed does not disturb the randomness of either

TABLE 1.—*Derivation of 2 random groups of children available for complete observation, and number in each group receiving prophylactic[1] pertussis vaccine before end of observation period*

	"V" group	"N" group	"V"+"N" group
(*a*) Original names transcribed from health station and clinic rolls	976	978	1,954
(*b*) Children located for observation as of June 1, 1938, after allocation of duplicates in (*a*)	641	571	1,212
(*c*) Children located (*b*) with history of definite pertussis prior to June 1, 1938	69	68	137
(*d*) Children lost from observation during interval June 1, 1938–March 30, 1941 (exclusive of *c*)	79	71	150
(*e*) Children completely observed throughout interval June 1, 1938–March 30, 1941 (*b* minus *c* minus *d*)	493	432	925
(*f*) Observed children (*e*) receiving alum-precipitated pertussis vaccine prophylactically[2]	454	24	478
(*g*) Observed children (*e*) receiving other pertussis vaccine prophylactically	14	20	34

[1] A vaccine was considered to have been given prophylactically if given to a child who did not have a definite case of pertussis with cough beginning within 3 weeks following the first injection of vaccine.
[2] Of the 478 receiving alum-precipitated vaccine, all received two doses except 11 in the "V" group and 2 in the "N" group, who received only one dose.

group and was due to the later date of search for this group, after school was dismissed and summer vacation in progress.

The second problem, that of obtaining adequate uniform observation of the injected and noninjected children, was handled by the full-time employment of only two highly capable, sympathetic, and interested public health nurses experienced in communicable disease work in this city. Together they received special training to perfect their uniform approach to the families of the selected children, their uniform use of nonleading questions, their uniform vocabulary for eliciting information desired, and their uniform accuracy in obtaining, evaluating, and recording such information. The nurses expended no little effort in gaining the confidence of the families under their surveillance so as to enhance the amount and trustworthiness of the information elicited. To aid cooperation, the nurses contributed their experienced health teaching service and offered free clinic and hospitalization service for illnesses in children of families unable to afford medical service. They were not officially concerned with the quarantine of communicable disease; however, they endeavored to persuade voluntary isolation of cases during the communicable period.

A visiting record was prepared for each household in which a selected child resided. The nurses divided the records about equally, primarily on the basis of routes convenient for a routine visit once each month to each child, but during the earlier months of observation, time did not permit revisiting within the month children found not at home at the time of the routine monthly visit. It is of interest to note that division of the work on this basis resulted in each nurse having a nearly equal proportion of children in the "V" and "N" groups and a nearly equal proportion of older and younger children, and also, as would be expected, a disproportionate number of white and colored children.

Soon after the start of monthly surveillance it became evident that adequate observation required that the nurses make repeated weekly and more frequent visits during the course of pertussis infection. To accomplish this the families were requested to call the nurse for other than routine visits whenever anyone living in the household with the selected child was exposed to or had suspicious symptoms of common communicable disease. Other public health nurses in the city cooperated by the daily reporting of all cases of communicable disease coming to their attention. This special effort to effect early visiting of cases was not instituted until after the 1938 pertussis epidemic. Partly as the result of this, 20 percent of the cases of pertussis occurring in the "V" group of children under observation throughout the interval from June 1, 1938, to March 30, 1941, did not receive weekly visits before the end of the fourth week following onset of cough, and 17 percent of cases in the "N" group did not receive such early weekly visits. Of the remaining cases, 73 percent occurring in the "V" and 76 percent occurring in the "N" group of children were under weekly

or more frequent observation before the end of the second week of cough. This indicates the uniformity with which the "V" and "N" groups were observed and suggests the adequacy of observation. The nurses did not know which of the children were in the "V" or "N" group and made every reasonable effort to avoid knowing which of the children had received pertussis vaccine. Of course, informants not infrequently would invite the nurses' attention to children supposed to have received the vaccine, but little credence was given to such information because some parents were obviously confused between pertussis and diphtheria injections.

A consulting pediatrician was employed to examine many of the cases and suspected cases of pertussis and to make a written report especially noting other diseases which might influence severity or obscure diagnosis. He did not know what criteria the author used for the diagnosis of clinical pertussis, and his report was not submitted until the end of the observation period here reviewed; he did not have access to the nurses' records and his opinions were not made known to them during the course of the study.[4] The author also made at least one visit with the nurse to every case of suspected pertussis, evaluated symptoms elicited, and arrived at a conclusion with respect to diagnosis. This was done entirely independently of the consulting pediatrician, and, like him, without knowledge of whether the child had had pertussis vaccine or had been selected in the "V" or "N" group.

The third problem was to define pertussis as a clinical entity which, within the limits of observation available, could be uniformly and readily recognized in the "V" and "N" groups. To this end the following minimal criteria were adopted for the author's diagnosis of a definite case of clinical pertussis.

(*a*) The child must have a cough lasting longer than 18 days, and for at least 8 days of this time the cough must be unremittently paroxysmal in type and recur at least three times each calendar day of the 8. The paroxysm is defined as a spell, spasm, or fit of coughing with a sudden onset at a not definitely predictable time. The child must be practically, if not absolutely, free from cough during the period between paroxysms; due allowance in judgment, however, was permitted for children having coughs due to other causes upon which pertussis infection may be superimposed.

(*b*) The paroxysm must consist of a rapidly repeated series of coughs, most of which result in almost complete exhalation of supplemental air as evidenced by history or observation of suffusion of the face and watering of the eyes, and either whooping following most of the series of coughs or the repeated occurrence of four or more successive coughs without intervening inhalation. The intensity of the

[4] Although the pediatrician was at a disadvantage in that he was seldom acquainted with the family visited, and usually made only one visit, and often that visit was not at the optimum time for obtaining the best history upon which to base his opinion as to diagnosis, there was remarkable uniformity between his diagnoses and those independently made by the author, after more detailed and complete information was available. The consultant considered at the time of his visit that 2 "V" and 1 "N" children had pertussis, whereas the author finally classified these children as doubtful cases, that is, not definite clinical pertussis. On the other hand, the consultant considered another "V" child to have a doubtful case, whereas the author finally classified the case as definite.

paroxysm must be sufficient to arouse the child from a deep sleep on many occasions and to cause him, if physically able, to sit up in bed, or at least to get up on his knees, to cough and get his breath.

(c) Clinical pertussis must be the most likely clinical diagnosis in the judgment of the examining physician, regardless of history of prior attack of pertussis, recent exposure to the disease, or information, which occasionally might be disclosed, concerning vaccination against the disease.

(d) The information concerning the clinical syndrome must be sufficiently reliable and complete to establish beyond reasonable question the true existence of the above minimal criteria.

It was recognized that the above more or less arbitrary definition might not suffice. Accordingly, detailed clinical records were kept for each child, recording the occurrence, duration, nature, frequency, and intensity of cough, paroxysmal cough, whooping, vomiting, and other symptoms and signs of clinical pertussis. One of the purposes for collection of this mass of data was to permit eventually an objective decision as to the definition of a case of pertussis, subject to modification as data accumulated. For this report the above definition was adhered to, and it is intended to include only frank cases of pertussis and to exclude possible subclinical and borderline cases.

The above discussion of the three major problems involved in this effort to determine whether or not the vaccine confers any real protection against pertussis describes the clinical-epidemiological arrangement whereby certain specific information was accumulated. A history of the past and current experiences of each child with measles, chickenpox, mumps, and pertussis was meticulously sought. It was recorded together with the date of such experience as accurately as this could be reasonably approximated. These data were checked and rechecked during the period of observation, particularly at times when the disease occurred in the neighborhood and the informant's memory was stimulated thereby. Whenever a history of experience with communicable disease was obtained, every reasonable effort was made to confirm it. This history, in practically every instance, consisted of a detailed description of the disease experience and was further confirmed by consultation with the private or clinic physician whenever one had been in attendance. On each monthly visit to the household the nurse made specific inquiry and record concerning each child with respect to all illnesses, particularly coughs and coryzas, and exposures to communicable disease that occurred during the month since last visit.

The period of observation covered by this report began June 1, 1938, and ended March 30, 1941, and was approximately the 34 months following the injection of the first dose of vaccine in the "V" group. Table 1 shows that 137 located children had had pertussis prior to this period. These 137 children were dropped from further observation prior to June 1, 1938. No child was dropped on account

of an attack of pertussis or any other disease subsequent to June 1, 1938. All other selected children have been kept under continuous monthly observation since, unless they became lost on account of moving away from the city or dying. As indicated in table 1, 79 of the "V" and 71 of the "N" group were thus lost during the observation period; of these, 1 of the "V" and 7 of the "N" group had an attack of pertussis during the observation period prior to being lost. The experience of these 150 lost children and of the 137 with a previous history of pertussis is included in the first part of table 2 but not included in the other tables, 3 and 4, of this report.

RESULTS

Table 2 records the experience of the "V" and "N" groups of children with measles, chickenpox, mumps, and pertussis, both prior to and during the observation period. Since age is important, but constantly changing, the experience for each disease has been divided according to whether the children were born (A) prior or (B) subsequent to July 1, 1937. Thus the children of the "B" subdivision were less than 11 months of age on June 1, 1938, the start of the observation period. Table 2 shows that the proportionate number of cases of measles, chickenpox, and mumps that occurred in the "V" and "N" groups of children (subdivided by age) prior to June 1938, and also from June 1938 to March 1941, were as nearly equal as might be expected by chance sampling variation. Likewise the proportionate number of cases of pertussis occurring in the "V" and "N" groups prior to June 1938 were approximately equal. In striking contrast, the proportionate number of cases of pertussis occurring in children during the 34-month observation period was much lower in the "V" than in the "N" group, in both the younger and older subdivisions.

Table 2 divides the children into subdivisions, A and B, according to birth date. Three other tabulations were prepared under exactly the same captions as table 2, with the exception that instead of dividing the "V" and "N" groups of children according to birth date, one tabulation divided the groups according to sex, another according to color, and the third according to geographic section of residence.[5] Each of these tabulations showed the same similarities and difference as those mentioned above for table 2. The proportionate number of cases of measles, chickenpox, and mumps in the past and in the observed experience of the "V" and "N" groups so subdivided by sex, color, and section of residence, were as nearly equal as might be expected by chance sampling variation in random groups. Likewise

[5] In the subdivision of the "V" and "N" groups by geographic section, all children were assigned to the section in which they resided as of June 1, 1938, and several of the smaller and outlying sections were combined so as to give 6 larger sections, 3 colored and 3 white. This subdivision resulted in some instances in an extremely small experience, but, in spite of this, the distribution of cases was remarkably consistent with the conclusions.

TABLE 2.—*Measles, chickenpox, mumps, and pertussis in "V" and "N" groups of children born (A) prior and (B) subsequent to July 1, 1937*

Disease	Birth date	Selection	Part 1: Experience prior to June 1, 1938, of children located as of that date having known history with respect to specified disease			Part 2: Observed experience of children having no attack of specified disease prior to June 1, 1938, and observed throughout the subsequent 34 months		
			Number of children	Number of cases	Percent attacked	Number of children	Number of cases	Percent attacked
Measles	A	V	323	69	21.36	204	35	17.16
		N	271	61	22.51	184	30	16.30
		Total	594	130	21.89	388	65	16.75
	B	V	277	13	4.69	224	26	11.61
		N	242	12	4.96	196	21	10.71
		Total	519	25	4.82	420	47	11.19
Chickenpox	A	V	283	28	9.89	234	45	19.23
		N	245	29	11.84	203	44	21.67
		Total	528	57	10.80	437	89	20.37
	B	V	252	9	3.57	226	54	23.89
		N	227	5	2.20	197	32	16.24
		Total	479	14	2.92	423	86	20.33
Mumps	A	V	284	5	1.76	254	36	14.17
		N	244	1	0.41	230	33	14.35
		Total	528	6	1.14	484	69	14.26
	B	V	252	2	0.79	232	13	5.60
		N	227	0		202	16	7.92
		Total	479	2	0.42	434	29	6.68
Pertussis	A	V	344	52	15.12	259	29	11.20
		N	304	45	14.80	230	90	39.13
		Total	648	97	14.97	489	119	24.34
	B	V	297	17	5.72	234	22	9.40
		N	267	23	8.61	202	60	29.70
		Total	564	40	7.09	436	82	18.81

the past experience of pertussis was nearly equal in the "V" and "N" groups, but again, in each subdivision of each of the three tabulations, the occurrence of pertussis during the observed, postvaccinal period was much lower in the "V" than in the "N" group.

Another tabulation covering the observation period was prepared showing the number of cases of pertussis occurring under the observation of each nurse making the monthly visits. For each of the two nurses the low incidence of cases in the "V" group was consistent, being 11 and 10 cases per hundred children as compared with 32 and 38 in the "N" group, for the two nurses, respectively.

Table 3 arranges the 201 cases of pertussis that occurred in the "V" and "N" groups according to an arbitrary grouping by the number of days' duration of paroxysmal coughing and whooping. It shows that if more conservative criteria with respect to duration of paroxysmal cough had been adopted for the definition of a case of

TABLE 3.—*Distribution of definite cases of pertussis occurring during 34-month interval, June 1938–March 1941, in the "V" and "N" groups of children under observation throughout that interval, according to duration of paroxysmal coughing and whooping*

Days duration		"V" group (493 children observed)		"N" group (432 children observed)		"V"+"N" groups	Ratio "N" percent/"V" percent
Paroxysmal coughing	Whooping [1]	Number of cases	Percent of children observed	Number of cases	Percent of children observed	Number of cases	
0–27	0–27	27	5.48	27	6.25	54	1.14
More than 27	0–27	11	2.23	54	12.50	65	5.61
More than 27	More than 27	13	2.64	69	15.97	82	6.05
All cases		51	10.34	150	34.72	201	3.36

[1] 2 cases in the "V" and 11 in the "N" group had no whooping.

pertussis, the difference between the "V" and "N" groups in the observed experience with pertussis would have been even more striking than with the criteria used.

Table 4 presents the total white and colored experience with pertussis during the 34-month observation period. In connection with this table it may be stated that the colored "V" group was more completely vaccinated than the white "V" group, and the colored "N" group was more completely not vaccinated than the white "N" group. Ninety-eight percent of the children in the colored "V" group received one or more injections of pertussis vaccine prophylactically as against 91 percent in the white "V" group, and 91 percent in the colored "N" group were entirely without prophylactic vaccine as against 88 percent in the white "N" group.

It is believed that the observed incidence of pertussis in the "N" group is a normal incidence of pertussis because nothing was done to this group which would be expected to influence appreciably the incidence and because the estimated average annual attack rate (110

TABLE 4.—*Distribution of definite cases of pertussis occurring during 34-month interval, June 1938–March 1941, in white and colored children under observation throughout that interval according to selection in the "V" or "N" group*

Color	Selection	Number of children	Number of cases	Percent attacked	Ratio "N" percent/"V" percent
White	V	220	26	11.82	
	N	199	62	31.16	
	Total	419	88	21.00	2.64
Colored	V	273	25	9.16	
	N	233	88	37.77	
	Total	506	113	22.33	4.12
White and colored	V	493	51	10.34	
	N	432	150	34.72	
	Total	925	201	21.73	3.36

per 1,000) for the white children observed approximates that commonly reported for white children in this age group and environment, even though the observed experience covers one and one-half epidemic periods and only one inter-epidemic period. Since the "V" and "N" groups of children in this study were strict random samples of the combined groups, since the observation of each group was pursued with equal diligence and uniform criteria were used to enumerate cases, and since the only known difference between the groups was the injection of alum-precipitated pertussis vaccine into a large proportion of the "V" group of children, whereas only a small proportion of the "N" group of children were so injected, it is believed that the vaccine used was responsible for the disproportionately smaller number of cases of pertussis observed in the "V" as compared with the "N" group or with the combined groups. No other conceivable influence could be consistent with these results, operating in each geographic section of the city, in the white as well as in the colored race, in males as well as in females, and in the younger as well as in the older children.

CONCLUSION

The two 1-cc. doses of alum-precipitated pertussis vaccine injected, with a 4-week interval between doses, into a large proportion of a group of children in Norfolk, Va., conferred real protection against clinical attacks of the disease.

REFERENCES

(1) Harrison, W. T., Franklin, Jos. P., and Bell, Jos. A.: Prophylactic value of a single dose of precipitated pertussis vaccine. Pub. Health Rep., **53**: 793 (May 20, 1938).

(2) Tippett, L. H. C.: Random Sampling Numbers. Tracts for Computers, No. 15, edited by Karl Pearson. Cambridge University Press, London, 1927.

SUSCEPTIBILITY OF YOUNG MICE (*MUS MUSCULUS*) TO *LEPTOSPIRA ICTEROHAEMORRHAGIAE*[1]

By Carl L. Larson, *Assistant Surgeon, United States Public Health Service*

The guinea pig is generally accepted as the most suitable animal for use in experimental studies of Weil's disease for it develops a very characteristic disease following inoculation with material containing *Leptospira icterohaemorrhagiae*. Although mice (*Mus musculus*) have been found to be carriers of leptospirae in nature, they have not been widely used in the laboratory as they have been considered to be relatively resistant to infection. The purpose of this paper is to report the uniform susceptibility of young white mice (*Mus musculus*) to frank infection with *L. icterohaemorrhagiae*.

[1] From the Division of Infectious Diseases, National Institute of Health.

Inada et al. (*1*) found rabbits to be extremely resistant to *L. icterohaemorrhagiae* and white mice and rats only slightly less so. In regard to white mice, they write: "Fourteen were inoculated with the liver emulsion or blood of the infected guinea pig, of which four showed jaundice and slight hemorrhage and succumbed." Wirth (*2*), Noguchi (*3*), and Packchanian (*4*) have all noted that mice (*Mus musculus*) may be carriers of *L. icterohaemorrhagiae* under natural conditions and have isolated leptospirae from them. According to Hiroki (*5*), mice are less susceptible to leptospiral infections than are rats or guinea pigs. According to Langworthy and Moore (*6*), white mice become carriers of these organisms, and Uhlenhuth (*7*) found house mice to be free of infection in nature. In an excellent review Walch-Sorgdrager (*8*) has adequately summed up the experimental work dealing with the relation of mice and leptospirae and concludes that, while mice can be infected experimentally, they usually develop a mild type of disease resulting in the establishment of a carrier state.

Meyer et al. (*9*) failed to infect deer mice (*Peromyscus sp.*) with *L. icterohaemorrhagiae;* Packchanian (*10*), however, presented abundant evidence of the extreme susceptibility of deer mice to this organism, but believed white mice to be highly resistant. Twenty-eight white mice were inoculated with doses of leptospirae which were fatal to deer mice and guinea pigs, but none of the white mice succumbed. Packchanian states: "The mice (*Mus musculus*), which were also inoculated as controls, survived." Syverton, Stiles, and Berry (*11*) found gophers (*Citellus richardsoni*) to be subject to experimental leptospirosis. At present, the most valuable animals at hand for use in studies of Weil's disease appear to be guinea pigs and deer mice, but, for reasons of expense, availability, and interpretation of experimental results, it would be desirable to discover another animal combining the features of cheapness, adequate supply, and extreme susceptibility with that of being a natural host.

In view of the fact that white mice fulfill these requirements and since a few workers have succeeded in inducing clinical leptospirosis in a small proportion of white mice inoculated, it was deemed worth while to investigate further the susceptibility of these animals to experimental infection.

MATERIALS AND METHODS

The major portion of the work to be reported has been done with three strains of *Leptospira icterohaemorrhagiae.* All were isolated from wild rats (*Rattus norvegicus*). Strain 1653 was obtained from Dr. A. Packchanian, who recovered it from a wild rat trapped in Washington, D. C. It had been grown on Verwoort's medium by the author from April 4, 1940, to June 20, 1940, when mouse passage was begun.

During the above interval, it was tested for pathogenicity in guinea pigs and was found to be highly virulent.

L. icterohaemorrhagiae strain 11 was directly isolated in white mice by inoculation with a suspension of kidney taken from a wild rat trapped on a dump in Arlington County, Virginia, on July 12, 1940. This strain also is pathogenic for guinea pigs.

Dr. G. Denison kindly supplied us with strain 18, which was recovered in guinea pigs from a wild rat caught in Jefferson County, Alabama, in 1940.

The white mice used throughout the work were *Mus musculus* kept at the animal breeding quarters of the National Institute of Health at Bethesda, Md. Young animals, between 3 and 7 weeks old, were employed. It is important that young animals be chosen for studies of leptospirosis. They tolerate at least 0.6 cc. of suspension administered intraperitoneally.

No special techniques are required to establish leptospirosis icterohaemorrhagica in mice. Infective material is obtained from mice which are *in extremis* or which have but recently died. The liver and kidneys, or other selected organs, are removed under sterile precautions and ground in a mortar with sufficient salt solution to make a 10 percent emulsion. The suspension is allowed to settle for a short time in a conical container before inoculation in order that the gross particles of tissue may settle out. As occasion demands, further serial dilutions may be made in salt solution. This suspension is then inoculated intraperitoneally into the young mice in doses of 0.1 to 0.5 cc. Oral, subcutaneous, or intracerebral routes of injection may also be employed. Following administration of infective material the animals are observed for development of typical signs of the disease.

EXPERIMENTAL

Passage of leptospirae in mice.—In consideration of the fact that white mice (*Mus musculus*) were considered to be refractory to infection with *L. icterohaemorrhagiae*, strain 1653 was first passed through a known susceptible host before the initial attempt to establish it in mice, for it had been grown on artificial culture media for some time before inception of the experiment.

A deer mouse (*Peromyscus sp.*) was inoculated intraperitoneally with 0.2 cc. of a culture of strain 1653 on June 20, 1940. It died in 5 days with lesions characteristic of Weil's disease. The liver of this animal was removed and ground in saline with sand to make a 10 percent suspension. After settling, the supernatant fluid was injected into the peritoneal cavity of four white mice, all of which died within 8 days with generalized jaundice and hemorrhages in the lungs. *L. icterohaemorrhagiae* was isolated on Verwoort's medium

from three of the four mice. Continuous passage has been maintained in mice through 27 generations over a period of 183 days (table 1). During these passages only 3-week-old mice were used to perpetuate the strain. Inoculations were made intraperitoneally, using 0.2 to 0.5 cc. of a 10 percent liver and kidney suspension in salt solution. During the first 10 generations in mice the length of time elapsing between injection and death varied from 5 to 15 days, and during the next 10 passages from 4 to 9 days. No survivors were encountered in this series of mice and all animals presented jaundice prior to death.

TABLE 1.—*Serial passage of L. icterohaemorrhagiae (strain 1653) in white mice*

Passage No.	Date of inoculation (1940)	Number and species of mice used	Number of mice dying	Dates of death (1940)	Number of days between inoculation and death	Cultures made and organisms isolated	Guinea pigs inoculated and Weil's disease produced
	June 20	1 Peromyscus sp	1	June 25	5		
1	June 25	4 Mus musculus	4	July 1; July 3	6-8	3 of 4	
2	July 1	do	4	July 10; July 12	9-11	+	
3	July 10	do	4	July 19; July 21	9-11	+	
4	July 19	do	4	July 28; July 29	9-10		
5	July 28	do	4	Aug. 5	8		
6	Aug. 5	do	4	Aug. 12	7	--------	1—typical.
7	Aug. 12	do	4	Aug. 17; Aug. 22	5-10	--------	Do.
8	Aug. 17	do	4	Aug. 22; Aug. 24	5-7		
9	Aug. 24	6 Mus musculus	6	Aug. 30; Sept. 4	6-11	+	1—typical.
10	Aug. 31	do	6	Sept. 10; Sept. 15	10-15	+	Do.
11	Sept. 10	4 Mus musculus	4	Sept. 17	7	+	
12	Sept. 17	5 Mus musculus	5	Sept. 24; Sept. 26	7-9		
13	Sept. 24	do	5	Sept. 30; Oct. 2	6-8		
14	Sept. 30	do	5	Oct. 7	7	+	
15	Oct. 7	do	5	Oct. 12; Oct. 15	5-8	+	
16	Oct. 12	7 Mus musculus	7	Oct. 17; Oct. 18	5-6		
17	Oct. 17	5 Mus musculus	5	Oct. 23	6	+	
18	Oct. 23	7 Mus musculus	7	Oct. 28; Oct. 30	5-8		
19	Oct. 28	10 Mus musculus	10	Oct. 31; Nov. 4	4-7		
20	Nov. 4	do	10	Nov. 12; Nov. 14	8-10		
21	Nov. 12	5 Mus musculus	5	Nov. 18	6		
22	Nov. 18	do	5	Nov. 24; Nov. 25	6-7		
23	Nov. 25	do	[1] 4	Dec. 2	7	+	
24	Nov. 27	6 Mus musculus	6	Dec. 3; Dec. 4	6-7		
25	Dec. 3	5 Mus musculus	5	Dec. 7; Dec. 9	4-6		
26	Dec. 9	8 Mus musculus	8	Dec. 14; Dec. 17	5-8	--------	9—typical; 1—jaundiced but recovered.
27	Dec. 14	10 Mus musculus	10	Dec. 23; Dec. 25	6-8		

[1] 1 killed Nov. 27, 1940, for passage.

Strain 11 was passed through 25 generations of white mice from July 12, 1940, to December 26, 1940, an interval of 167 days, without being in contact with hosts other than the rat from which it was originally isolated (table 2). The method of passage was the same as that for strain 1653. Only one mouse survived. This animal was one of six inoculated in the eighth passage and it developed jaundice and marked edema prior to recovery. During the first 10 passages the interval between injection and death was 5 to 11 days, and from 5 to 9 days in the next 10 generations. The disease produced by this organism is the same as that caused by strain 1653.

TABLE 2.—*Serial passage of L. icterohaemorrhagiae (strain 11) in white mice*

Passage No.	Date of inoculation (1940)	Number of white mice used	Number of mice dying	Dates of death (1940)	Number of days between inoculation and death	Cultures made and organism isolated	Guinea pigs inoculated and Weil's disease produced
1	July 12	3	3	July 22; July 23	10-11	--------	1—typical.
2	July 23	4	4	July 30; Aug. 1	7-9	--------	1—typical.
3	Aug. 1	4	4	Aug. 8; Aug. 10	7-9	+	1—typical.
4	Aug. 9	4	4	Aug. 14; Aug. 16	5-7	+	1—typical.
5	Aug. 15	4	4	Aug. 22; Aug. 24	7-9	+	
6	Aug. 22	4	4	Aug. 27; Aug. 28	5-6	+	
7	Aug. 28	4	4	Sept. 4; Sept. 5	7-8		
8	Sept. 4	6	5	Sept. 9; Sept. 10	5-6		
9	Sept. 10	4	4	Sept. 17; Sept. 18	7-8	--------	1—typical.
10	Sept. 17	4	4	Sept. 24; Sept. 25	7-8		
11	Sept. 24	5	5	Sept. 30; Oct. 1	6-7		
12	Sept. 30	5	5	Oct. 7	7		
13	Oct. 7	5	5	Oct. 12; Oct. 14	5-7	+	
14	Oct. 12	6	6	Oct. 18; Oct. 19	6-7	+	
15	Oct. 18	5	5	Oct. 23; Oct. 25	5-7		
16	Oct. 23	7	7	Oct. 28; Oct. 30	5-7		
17	Oct. 28	10	10	Oct. 31; Nov. 4	3-7		
18	Nov. 4	10	10	Nov. 12; Nov. 13	8-9		
19	Nov. 12	5	5	Nov. 19; Nov. 20	7-8		
20	Nov. 19	5	5	Nov. 24; Nov. 26	5-7		
21	Nov. 26	4	[1]	Nov. 27	--------	+	
22	Nov. 27	5	5	Dec. 5; Dec. 8	8-11		
23	Dec. 5	8	8	Dec. 8; Dec. 11	3-6	--------	2—typical.
24	Dec. 10	8	8	Dec. 16; Dec. 17	6-7		
25	Dec. 17	5	5	Dec. 23; Dec. 26	6-9		

[1] Accidental death.

Strain 18 has been passed in mice for only a limited number of generations but the findings are in agreement with those observed for the other organisms (table 3).

TABLE 3.—*Passage of L. icterohaemorrhagiae (strain 18) in white mice*

Passage No.	Date of inoculation (1940)	Number of white mice used	Number of mice dying	Dates of death (1940)	Number of days between inoculation and death	Cultures made and organism isolated	Guinea pigs inoculated and Weil's disease produced
1	Nov. 19	5	5	Nov. 25; Nov. 26	6-7		
2	Nov. 26	4	[1]		--------	+	
3	Nov. 27	8	8	Dec. 5; Dec. 7	8-10		
4	Dec. 5	4	4	Dec. 10; Dec. 11	5-6	--------	3—typical.
5	Dec. 11	10	10	Dec. 17; Dec. 21	6-10		
6	Dec. 18	10	10	Dec. 25; Dec. 26	7-8		

[1] Accidental death.

Recovery of *L. icterohaemorrhagiae* from sick or dead mice, and the ability of these cultures and of tissue from infected mice to produce typical evidence of leptospirosis in guinea pigs, show that the organisms involved are those which were originally injected. Leptospirae obtained from mice during the course of the experiment reacted specifically with antileptospira serum obtained from various sources. No other pathogenic organisms were encountered during the study, although occasional cultures made from infected mice were contaminated with nonpathogenic organisms.

Symptoms and signs of leptospirosis in mice.—The disease produced in mice by *L. icterohaemorrhagiae* is very characteristic and easily recognized. After an incubation period of 3 to 7 days, the mice become listless and inactive, their fur is ruffled, and the animals appear acutely ill. Icterus usually appears 1 to 2 days before death, being most marked in the ears. The eyelids, sclerae, conjunctivae, and the webs of the feet are also yellow. Yellow urine may be expressed from the bladder when jaundice is present. Extreme weakness and tremors usually are noted before death occurs. Convulsive seizures may be noted just before the animal dies.

Gross pathological lesions consist essentially of icterus of the subcutaneous tissue and kidneys, hemorrhages of various extent in the lungs, congestion of the lymph nodes, and slight damage to the liver, which in most cases is pale and soft. The hemorrhagic condition of the skin and serous membranes noted in deer mice and guinea pigs is only occasionally encountered in white mice, and then is present only to a limited degree. In the latter animals hemorrhage of the lungs is a more constant feature, but the size and frequency of occurrence vary considerably. When mice survive for a prolonged period, generalized edema may appear. This has been observed in only a few instances, and in none were gross causes for this condition noted. Microscopic examination of tissues has been done in a number of instances, and, although the lesions are not well marked, leptospirae are demonstrable in the liver and kidneys of mice suffering from leptospirosis. It is apparent that *L. icterohaemorrhagiae* can be passed in young mice for indefinite periods without loss of virulence for guinea pigs.

Routes of infection.—Mice are susceptible to leptospirosis when infected material is given intraperitoneally, subcutaneously, or orally (table 4). Although the oral route does not appear to be as efficient as the others studied, it suggests that ingestion of organisms might be the method whereby rodents may become infected in nature. It has been demonstrated (*11*) that gophers become infected after ingestion of carcasses of animals dying of leptospirosis.

Relation of age of mice to resistance against leptospirae.—Because most workers report white mice to be relatively insusceptible to

TABLE 4.—*Susceptibility of 3-week-old white mice to L. icterohaemorrhagiae administered by various routes*

Dilution	Route	Strain 18	Strain 11	Route	Strain 18	Strain 11	Route	Strain 18	Strain 11
10^{-1}	Intraperitoneal	5/0	5/0	Subcutaneous	5/0	5/0	Oral	5/0	5/0
10^{-2}	do	5/0	5/0	do	5/0	5/0	do	5/0	4/1
10^{-3}	do	5/0	5/0	do	5/0	5/0	do	3/2	3/2
10^{-4}	do	3/2	4/1	do	2/3	1/4	do	3/2	0/5

Numerator=Number of mice dying.
Denominator=Number of mice surviving.

402837°—41——2

leptospiral infections, it is indicated, in view of our results, that unsuitable mice were tested to determine susceptibility. Adult guinea pigs are more resistant to leptospirae than young ones; this is also the case among mice. Table 5 shows the results obtained

TABLE 5.—*Susceptibility of white mice of various ages to L. icterohaemorrhagiae*[a]

Age of mice (weeks)	Number injected	Strain of leptospirae	Number of deaths in days														Total number of deaths	Percent mortality
			1st	2d	3d	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th		
3	27	11	----	----	1	----	4	8	13	1	----	----	----	----	----	----	27	100
4	30	11	----	----	1	----	----	1	21	5	2	----	----	----	----	----	30	100
5	30	11	----	----	----	----	2	1	8	7	8	1	----	----	----	----	27	90
6	30	11	----	----	----	----	----	----	6	9	5	3	2	----	----	1	26	86.6
7	30	11	----	----	1	----	----	1	7	2	5	1	1	----	1	----	19	63.3
3	27	1653	----	1	----	3	5	8	----	4	3	3	----	----	----	----	27	100
4	29	1653	----	----	----	----	----	6	8	4	----	2	1	----	----	----	21	72.4
5	30	1653	----	----	2	----	5	----	5	4	3	----	1	1	----	----	21	70.0
6	30	1653	----	----	----	----	1	----	3	3	6	2	1	1	----	----	17	56.6
7	30	1653	----	----	----	----	----	1	1	1	2	2	1	1	----	----	9	30.0

following inoculation of mice of different ages with strains 1653 and 11 of *L. icterohaemorrhagiae.* The former strain was given to mice in its eighteenth to twentieth mouse passage and the latter in its sixteenth to eighteenth generation in white mice. Intraperitoneal inoculation of 0.3 cc. doses of 10 percent infected liver and kidney emulsion was used to produce infection. This amount of material was found to be capable of producing jaundice and death in certain of the mice from 3 to 7 weeks of age. Jaundice develops most rapidly and affects all animals of the younger age group. Although it does appear in mice of the older age groups, icterus is delayed and does not manifest itself in all inoculated animals. In those 6- or 7-week-old mice which develop it, jaundice is intense. Death occurred within 10 days among all mice 3 weeks of age. There is a general tendency toward a decreasing mortality rate among mice as they become older. Among mice 7 weeks of age, the mortality rate was 63.3 percent and 30 percent, respectively, for strains 11 and 1653. The results obtained with strain 1653 are comparable to those of Inada et al. (*1*), who found 4 out of 14 mice to be susceptible and stated that this species was resistant to infection with *L. icterohaemorrhagiae.*

Distribution of deaths among mice due to leptospirosis.—The survival time increases while the death rate decreases as older mice are subjected to leptospiral infections. The survival time of 143 mice 3 weeks of age, which had been given 0.3 cc. to 0.5 cc. inocula of 10 percent infected mouse tissue intraperitoneally, is shown in table 6. All deaths occurred between the second and tenth days following inoculation, with 82.6 percent of the deaths falling between the fifth and seventh days. Reference to table 5 shows that as the age of the mice increases the interval between injection and death likewise increases. Among 4-week-old mice, 88.2 percent of deaths

caused by the leptospirae occur between the sixth and eighth days following injection; in 5-week-old mice 68.7 percent of deaths take place in 7 to 9 days; 74.4 percent of the deaths among 6-week-old mice are observed in 7 to 9 days, and 75 percent of the deaths among 7-week-old mice occur in 7 to 10 days.

TABLE 6.—*Survival time of 3-week-old mice infected with L. icterohaemorrhagiae*

Number of mice inoculated	Number of deaths in days										Percent mortality
	1st	2d	3d	4th	5th	6th	7th	8th	9th	10th	
35	------	------	------	4	8	10	13	------	------	------	100
20	------	------	------	1	5	6	6	2	------	------	100
20	------	------	1	1	6	8	4	------	------	------	100
14	------	------	------	------	11	3	------	------	------	------	100
27	------	------	1	------	4	8	13	1	------	------	100
27	------	1	------	3	5	8	------	4	3	3	100
143	------	1	2	9	39	43	36	7	3	3	------
Percent of total	------	0.7	1.4	6.3	27.3	30.1	25.2	4.9	2.1	2.1	100

Titration of infective agent in infected tissue.—In titrating infected tissues of sick or dead mice the passage experiments showed that 0.2, 0.3, and 0.5 cc. amounts of 10 percent tissue produced leptospirosis in all 3-week-old mice into which they were inoculated intraperitoneally. In a series of tests in which 0.3 cc. of varying dilutions of liver and kidney emulsion made from mice dying of leptospirosis was administered to each of 30 mice 3 weeks old, it was found that 10 percent and 1 percent suspensions killed all animals injected. Only 46.6 percent of the mice died when tested against 0.1 percent suspensions and 20 percent of those tested against 0.01 percent emulsions succumbed. No mice died after receiving 0.3 cc. of 0.001 percent suspension of liver and kidney from sick mice.

Distribution of leptospirae in infected mice.—In order to determine the distribution of leptospirae in mice suffering from Weil's disease, certain organs were removed from animals dead or killed *in extremis*. The organs were weighed, ground, and made into 10 percent suspensions in saline and further serial dilutions were made to 10^{-3}. They were then injected intraperitoneally in 0.3 cc. doses into young mice. Tissues from mice infected with strains 11, 1653, and 18 were tested in this manner. Care was taken to avoid any undue contact of one organ with another during removal from the mouse. Liver, kidney, spleen, lung, and brain all contained leptospirae, as evidenced by production of jaundice and death in the test mice. In general, tissue suspensions diluted 10^{-3} with 0.9 percent salt solution contained sufficient infective material to induce Weil's disease in mice. A 10^{-4} suspension of liver tissue failed to involve mice, but similar dilutions of kidney were found to be infective. Suspensions of brain, spleen, or lung did not yield such consistent results as did those of

liver and kidney when tested at dilutions of 10^{-3}, but were equally efficient at lower dilutions. Leptospirosis is a generalized infection in white mice showing little tendency toward localization in the kidney during its acute course.

Isolation of L. icterohaemorrhagiae from wild rats.—It seemed to be of value to attempt to isolate *L. icterohaemorrhagiae* from naturally infected sources in order to test the suitability of mice for diagnostic purposes. Wild rats collected in Arlington County, Virginia, and Washington, D. C., were selected for this work. Twenty-six rats which had been trapped alive were killed with ether. Their kidneys were removed, ground with sand in a mortar, and made into a 10 percent suspension in salt solution. One guinea pig and three or four mice were inoculated intraperitoneally with 2.0 cc. and 0.5 cc., respectively, of suspension from each rat. The results of the positive tests, with the exception of those from rat 11 from which strain 11 was isolated, are given in table 7. A total of 126 mice were used to recover the organisms from nine rats, and all developed jaundice and

TABLE 7.—*Isolation of L. icterohaemorrhagiae from wild rats in white mice*

Wild rat	Number of mice			Number of days between inoculation and death of mice	Number of guinea pigs			Number of mouse passages	Cultures obtained from mice
	Inoculated	Jaundiced	Died		Inoculated	Jaundiced	Died		
A7	15	15	15	5–11	5	5	5	5	+
A8	19	19	19	8–11	7	7	7	5	+
A25	12	12	12	6–9	2	1	2	3	+
A26	12	12	12	9–12	2	2	2	3	+
A27	16	16	16	5–7	4	3	4	4	+
A33	16	16	16	6–7	5	5	5	4	+
A35	12	12	12	7–10	2	2	2	3	+
A38	12	12	12	8–10	2	2	2	3	+
A39	12	12	12	8–11	2	2	2	3	+

died in from 6 to 12 days. Cultures of *L. icterohaemorrhagiae* were made from the organs of the mice used to perpetuate the passage, and, following inoculation, mouse passage was terminated. *L. icterohaemorrhagiae* was isolated from each rat by continuous passage in mice and cultivation of liver and kidney from these mice on Verwoort's medium. Passage was made for three generations in five cases and for four and five generations in each of two other cases.

Certain advantages were gained by using mice in addition to guinea pigs in trying to isolate leptospirae from naturally infected rats. In two experiments the guinea pigs died with secondary infection before jaundice appeared and the diagnosis would not have been made if mice had not also been employed. Guinea pigs died of leptospirosis one day earlier than did mice injected with corresponding material in two cases, and on the same day in two other cases, but the mice reacted 3 to 8 days earlier in the remainder of the experiments. As a

number of mice may be used at small cost and death occurs in them as early as, or earlier than, in guinea pigs, they can be utilized as test animals in suspected cases of leptospirosis.

DISCUSSION

An experimental animal which is a natural host of any specific disease is superior to one which is not, provided natural infection is ruled out. The conclusions drawn from experiments with such an animal may be directly applicable to conditions in the field. Although rats have been found to be the most common carriers of leptospirae, this may, in part, be due to the extremely large number of surveys made concerning infection in this species of rodent. Certainly the relatively few instances in which mice have been studied have yielded evidence of leptospirosis occurring spontaneously in these animals. The general results of previous experimental work on leptospirosis in mice have suggested that mice are resistant to infection and this is probably responsible for the general lack of interest in this phase of the problem.

It has been shown that *L. icterohaemorrhagiae* causes a uniform disease picture in young white mice, which is characterized by jaundice and a high mortality rate. As young mice are so very susceptible to the disease and present material advantage over other hosts in many respects, they must be included in the list of animals suitable for experimental use in the study of Weil's disease and other leptospiroses. This is especially true when large numbers of animals are required and when the cost of guinea pigs and the unavailability of deer mice prohibit their use.

CONCLUSIONS

1. Young white mice (*Mus musculus*) are extremely susceptible to *L. icterohaemorrhagiae* and develop signs of generalized infection prior to death. The mortality rate approximates 100 percent in 3-week-old mice, but falls rapidly as age increases.
2. Infection may be induced by inoculation of organisms by intraperitoneal, subcutaneous, or oral routes.
3. Three strains of *L. icterohaemorrhagiae* originally isolated from wild rats have been maintained in mice in a fully virulent state for 27, 25, and 6 passages.
4. White mice are suitable animals for laboratory studies of leptospirosis.

REFERENCES

(*1*) Inada, R., Ido, Y., Hoki, R., Kaneko, R., and Ito, H.: The etiology, mode of infection, and specific therapy of Weil's disease (spirochetosis icterohaemorrhagica). J. Exp. Med., **23**:377 (1916).

(*2*) Wirth, D.: Infektionsversuche mit Leptospiren. Wien. klin. Wchnschr., **30**:1115 (1937).

————: Die Leptospirose (Weilsche Krankheit) bei Tieren. Wien. Tierarzl. Monatschr., **24**:97 (1937).

(3) Noguchi, H.: Etiology of yellow fever. VIII. Presence of a Leptospira in wild animals in Guayaquil and its relation to *Leptospira icterohaemorrhagiae* and *Leptospira icteroides*. J. Exp. Med., **30**:95 (1919).
(4) Packchanian, A.: The occurrence of *Leptospira icterohaemorrhagiae* and *Spirochaeta morsus muris* in "laboratory white mice" (*Mus musculus*) at St Louis (1933) and extreme susceptibility and fatality of American deer mice (*Peromyscus*) to *Leptospira icterohaemorrhagiae*. Science, N. S., **83**:140 (1936).
(5) Hiroki, H.: Über die Übertragung der Leptospirosen auf Mäuse. Ztschr. f. Immunitätsforsch. u. exper. Therap., **96**:396 (1939).
(6) Langworthy, V., and Moore, A. C.: A study of *Leptospirae icterohaemorrhagiae*. J. Infect. Dis., **41**:70 (1927).
(7) Uhlenhuth, P.: Epidemiologie der Weilschen Krankheit. Acta Conventus Tertii de Tropicis Morbis, Pars I: 357–371 (1938).
(8) Walch-Sorgdrager, B.: Leptospiroses. Bull. Health Organ., League of Nations, **8**:143 (1939).
(9) Meyer, K. F., Stewart-Anderson, B., and Eddie, B.: Canine leptospirosis in the United States. J. Am. Vet. Med. Assoc., **95**:710–729 (1939).
(10) Packchanian, A.: Susceptibility and resistance of certain species of American deer mice, genus *Peromyscus*, and other rodents to *Leptospira icterohaemorrhagiae*. Pub. Health Rep., **55**:1389 (1940).
(11) Syverton, J. T., Stiles, W. W., and Berry, G. P.: Epidemiological studies on Weil's disease, with notes on the susceptibility of the "gopher" *Citellus richardsoni* (Sabine) to experimental inoculation of *Leptospira icterohaemorrhagiae*. J. Bact., **36**:279 (1938).

STATISTICS ON POLIOMYELITIS IN THE TERRITORY OF HAWAII

By Richard K. C. Lee, M. D., Dr. P. H., *Deputy Territorial Commissioner of Public Health, Honolulu, Hawaii*

There is little available information in the medical literature regarding the incidence of poliomyelitis in the semitropics, or about the distribution of this disease among the various races. McKinley in his text, "A Geography of Disease" (*4*), lists infantile paralysis as a disease normally considered characteristic of temperate climates. In the section on Hawaii, the distribution of the disease is described as general for all the islands in the Territory and is indicated as an important public health problem. In this same text, although poliomyelitis is reported to be present in Puerto Rico and the Philippine Islands, the author's conclusion is that the disease was not considered an important public health problem there. During the period of the survey for this text (1935), no cases of poliomyelitis occurred in Samoa, Guam, or the Virgin Islands. Rosenau (*6*) and other public health workers also describe the disease as one of the temperate zones. Aycock (*1*) states that, as the warm climates are approached, there is less of the disease and the tendency is toward more even distribution throughout the year.

Morales (*5*) reporting on an outbreak of acute anterior poliomyelitis in Puerto Rico in 1930 states "* * * reports of epidemic poliomyelitis in the Tropics are rare * * *." The disease has existed in endemic form in Puerto Rico for some time but no epidemic had been reported

before 1928. He referred to a report of the United States Public Health Service of an epidemic of poliomyelitis in Santa Clara, Cuba (140 cases), and Sao Paulo, Brazil (13 cases), in 1909.

The information presented in this article refers particularly to the incidence and distribution of poliomyelitis. No attempt has been made to report or discuss its clinical aspects. However, from personal communications with physicians treating patients afflicted with poliomyelitis, no clinical characteristic of the disease in the Territory of Hawaii is noted which has not been previously described.

The period of this study extends over the past 11 years, including the fiscal year 1940 when the most serious epidemic of poliomyelitis occurred in these islands. Statistics prior to this period are meager and incomplete.

Prior to 1922, poliomyelitis was not reported to the Board of Health. In table 1, two columns are given for cases reported or known to the Board of Health. One is the official list of the Bureau of Communicable Diseases, which comprises cases reported annually; the list of the Bureau of Crippled Children includes these cases plus known cases of poliomyelitis not reported to the Bureau of Communicable Diseases. These unreported cases were diagnosed at clinics for crippled children, held in all counties of the Territory. The majority of these unreported cases, numbering 76, were diagnosed long after the acute stage of poliomyelitis and were referred to the clinics for crippled children because of the residual paralysis.

Table 1 also shows the incidence rate of poliomyelitis. The rate for the year 1940, 23.67 per 100,000 population, far exceeded the average rate, and was higher than the rate for any other year for which data are available.

TABLE 1.—*Cases of poliomyelitis known to the Territorial Board of Health*

Fiscal year [1]	Bureau of Communicable Diseases		Bureau of Crippled Children		Territorial population
	Cases	Rate per 100,000	Cases	Rate per 100,000	
1922	1	0.34			291,515
1923	10	3.30			302,800
1924	13	4.12			315,372
1925	3	.92			326,045
1926	1	.30			330,932
1927	29	8.52			341,093
1928	5	1.42			353,208
1929	4	1.09			368,336
1930	17	4.59			370,620
1931	27	7.19	26	6.93	375,211
1932	16	4.20	23	6.04	380,507
1933	7	1.84	12	3.16	380,211
1934	14	3.69	9	2.37	378,948
1935	4	1.04	17	4.42	384,437
1936	43	10.93	13	3.31	393,277
1937	8	2.02	51	12.86	396,715
1938	10	2.43	30	7.29	411,485
1939	10	2.41	34	8.19	414,991
1940	101	23.67	101	23.67	426,654

[1] Ended June 30.

Except for the islands of Lanai and Niihau, poliomyelitis was reported from all islands in the Territory. Although it has been described as a disease of rural areas, the majority of reported cases occurred on Oahu which includes Honolulu City.

TABLE 2.—*Poliomyelitis cases and deaths, by islands, 1930–40*

Fiscal year	Oahu		Hawaii		Maui		Kauai		Molokai		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1930	11		7								18	
1931	15		10						1		26	
1932	21		1		1						23	
1933	8		3						1		12	
1934	7		2								9	
1935	12		3		2						17	
1936	5		7				1				13	
1937	26	1	13		10		2				51	1
1938	19		4	1	4		2		1		30	1
1939	23	6	3		6		1		1		34	6
1940	65		25	1	8		3				101	1
Total	212	7	78	2	31		9		4		334	9

During the fiscal year 1940 the island of Hawaii reported the highest rate per 100,000 population, 32.75, with Oahu second with a rate of 25.22, while the average rate for the Territory was 23.39. Kauai had a low rate of 8.42 per 100,000. Considering the period from 1930 to 1940, the highest case rate was reported in 1940, 23.67 per 100,000, and the lowest in 1934, 2.37. The second highest rate, 12.86, was for the year 1937. These figures are significant when they are compared with those of the mainland. The highest rate in the United States, 41.4 per 100,000 population, occurred in 1916, and the lowest, 1.3, in 1938. The second highest rate during the period from 1915 to 1938 was for 1931, 14.6 per 100,000. (See Public Health Reports for May 26, 1939, page 857.) The average for the 5 years 1934–38 was 5.32 per 100,000. The highest rate reported during this 5-year period was for the District of Columbia, 14.3 per 100,000 in 1935.

Table 3 shows the number of cases of poliomyelitis reported in Hawaii, by months, during the fiscal years 1930 to 1940. It is seen that, over the 10-year period 1930–39, the months of February, March, April, May, and June are particularly high, while during the epidemic year, 1940, May, June, July, and August are the high months. It is also noted that during these 11 years cases were reported more frequently in the months of March, April, May, and June than in any other group of months.

TABLE 3.—*Cases of poliomyelitis reported in Hawaii, 1930–40, by months*

Month	Fiscal year											Total
	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	
July	0	1	4	2	1	0	0	0	2	2	14	26
August	1	3	2	1	1	0	3	0	1	0	11	23
September	1	2	6	0	0	1	0	1	2	1	5	19
October	0	3	2	1	0	1	2	0	0	1	4	14
November	1	0	0	1	2	1	0	4	3	1	5	18
December	1	1	0	3	0	0	2	10	5	5	12	39
January	2	0	0	0	0	0	1	4	3	2	8	20
February	2	3	0	0	3	0	0	11	6	3	9	37
March	4	1	2	1	0	8	1	5	5	3	3	33
April	5	5	3	1	0	1	1	2	0	3	6	27
May	1	4	1	1	1	4	0	8	2	7	15	44
June	0	3	3	1	1	1	3	6	1	6	9	34
Total	18	26	23	12	9	17	13	51	30	34	101	334

Infantile paralysis is a warm-weather disease but spares warm countries. In temperate countries the number of cases rises in July, reaches its peak in August and September, and declines with the advent of cold weather. This seasonal periodicity repeats itself with marked regularity in all endemic regions of the temperate zone. In Kentucky during the period from 1917 to 1935, the highest incidence occurred during the months of July, August, September, and October (*3*). In Massachusetts, from 1916 to 1934, the highest incidence occurred during these same months (*6*). However, table 3 bears out Aycock's statement that in warm climates poliomyelitis has a tendency to be more evenly distributed throughout the year.

The primary purpose of this paper is to report rates of poliomyelitis among the racial groups in the Territory of Hawaii; the cosmopolitan population of the Territory offers a fertile field for epidemiological study. For many years we have been impressed by the high rate of poliomyelitis among the Caucasian population as compared to that among other racial groups. This was particularly noted during the epidemic year of 1940 when the rate for this racial group was 43.5 per 100,000 as compared to the average rate of 23.67 for the entire Territory. Low rates were reported for Filipinos, 7.67 per 100,000; Chinese, 10.41; and Japanese, 15.93. These figures are more or less borne out by the study of rates of crippled children with poliomyelitis in the register of the Bureau of Crippled Children. High rates are particularly noted in the Caucasian and Hawaiian and part-Hawaiian groups, being 57.38 and 79.64 per 100,000, respectively; Filipinos are lowest with a rate of 24.93 and the rate for Chinese is 34.71 per 100,000. These latter rates are cumulative, since poliomyelitis cases in the crippled-children register include old and new cases of all children with crippling deformities from infancy to 21 years of age.

TABLE 4.—*Racial distribution of cases of poliomyelitis in Hawaii*

Racial descent	Territorial population	Poliomyelitis cases	Rates per 100,000
(a) FISCAL YEAR ENDED JUNE 30, 1940			
Hawaiian and part Hawaiian	65, 291	17	26. 04
Caucasian	108, 055	47	43. 5
Puerto Rican	7, 781	2	25. 7
Chinese	28, 809	3	10. 41
Japanese	156, 849	25	15. 93
Korean	6, 761	3	44. 37
Filipino	52, 148	4	7. 67
Others	960		
Total	426, 654	101	23. 67
(b) YEARS 1930-40, INCLUSIVE[1]			
Hawaiian and part Hawaiian	57, 688	5. 6	9. 71
Caucasian	81, 055	7. 0	8. 64
Puerto Rican	7, 368	. 2	2. 71
Chinese	27, 264	1. 2	4. 40
Japanese	148, 972	7. 2	4. 83
Korean	6, 668	. 2	3. 0
Filipino	54, 668	1. 7	3. 11
Others	754	. 2	26. 53
Total	384, 437	23. 3	6. 06
(c) POLIOMYELITIS CASES REGISTERED WITH THE BUREAU OF CRIPPLED CHILDREN AS OF JUNE 30, 1940			
Hawaiian and part Hawaiian	65, 291	52	79. 64
Caucasian	108, 055	62	57. 38
Puerto Rican	7, 781	3	38. 56
Chinese	28, 809	10	34. 71
Japanese	156, 849	71	45. 27
Korean	6, 761	3	44. 37
Filipino	52, 148	13	24. 93
Others	960	3	312. 50
Total	426, 654	217	

NOTE.—Population figures compiled by the Bureau of Vital Statistics are subject to correction by the Federal Census of 1940.

[1] Population figures as of 1935.

In attempting to explain the high rates among the Caucasian group, it might be assumed that this group was more frequently exposed to the disease, which may have been brought to Hawaii from the mainland. However, the majority of cases in this racial group are among children born and reared here, and only a small number occur among those who have recently arrived from the mainland. The high rates cannot be attributed to nutritional status because the Caucasian group in general enjoys much better nutrition, housing, and sewage disposal facilities. I do not believe that there is a particular racial immunity to poliomyelitis. This might, of course, have some bearing, but, in my opinion, environmental opportunity or exposure to sources of infection is a more likely factor. Island children of Caucasian ancestry are doubtless more frequently exposed to recent mainland arrivals than those of other racial groups.

As shown in table 5, among Caucasians there is a wider distribution of poliomyelitis throughout all age groups, and particularly the older age groups. Of the 11 cases reported in persons over 20 years of age, 9 were among Caucasians, and the other 2 were in Japanese. This bears out Aycock's statement that there has been a gradual shift toward the occurrence of poliomyelitis in older age groups in both urban and rural populations in the last 20 years. This has been commented on by a number of observers in recent years, and has been considered by some as representing a major, but as yet inexplicable, change in the epidemiological behavior of the disease. However, among Japanese, Chinese, Koreans, and Filipinos, the largest number of cases occurs among children from 1 to 5 years of age. A total of 49 out of the 101 cases reported was among children of these ages. The distribution here is similar to that in other epidemics and reported studies.

TABLE 5.—*Cases of poliomyelitis reported in Hawaii during the fiscal year 1940, by age*

Race	Age at time of onset						Total
	Under 1 year	1–5	5–10	10–15	15–20	20 and over	
Hawaiian and part Hawaiian	2	12		3			17
Caucasian	5	17	5	8	3	9	47
Puerto Rican		1		1			2
Japanese	1	12	8	2		2	25
Chinese		1	1		1		3
Korean		2	1				3
Filipino		4					4
Total	8	49	15	14	4	11	101

During the epidemic year 1940, 81.19 percent of the cases reported occurred in persons under 14 years of age, 8.91 percent in the age group 14–21 years, and 9.9 percent in the group over 21 years of age. During the 11-year period from 1930 to 1940, of a total of 334 cases, 269, or 80.53 percent, occurred in the group under 14 years, 48, or 14.37 percent, in the 14–21-year group, and 17, or 5.09 percent, in persons over 21 years of age.

In this study the youngest poliomyelitis patient was 3 months old and the oldest patient was 69 years. Rosenau reports that 65 percent of all cases of this disease usually occur in children under 5 years of age and 95 percent in those under 10 years.

TABLE 6.—*Poliomyelitis cases reported in Hawaii, 1930–40, by age*

Age	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	Total
Under 14	16	25	22	12	8	15	12	31	20	26	82	269
14–21	2	1				1		20	9	6	9	48
Over 21			1		1	1	1		1	2	10	17
Total	18	26	23	12	9	17	13	51	30	34	101	334

TABLE 7.—*Age range of poliomyelitis patients, 1930–40*

Year	Youngest	Oldest	Year	Youngest	Oldest
		Years			*Years*
1930	5 months	19	1936	5 years 3 months	29
1931	8 months	19	1937	10 months	20
1932	1 year	29	1938	7 months	27
1933	1 year 5 months	13	1939	11 months	23
1934	3 years	27	1940	3 months	38
1935	1 year 7 months	69			

TABLE 8.—*Poliomyelitis cases reported in Hawaii, 1930–40, by sex*

Fiscal year	Oahu		Hawaii		Maui		Kauai		Molokai		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1930	8	3	3	4	0	0	0	0	0	0	11	7
1931	11	4	5	5	0	0	0	0	1	0	17	9
1932	14	7	------	1	1	0	0	0	0	0	15	8
1933	4	4	2	1	0	0	0	0	0	1	6	6
1934	4	3	2	0	0	0	0	0	0	0	6	3
1935	6	6	2	1	1	1	0	0	0	0	9	8
1936	3	2	3	4	0	0	1	0	0	0	7	6
1937	15	11	9	4	6	4	1	1	0	0	31	20
1938	10	9	3	1	2	2	0	2	1	0	16	14
1939	14	9	3	0	4	2	0	1	1	0	22	12
1940	44	21	14	11	6	2	2	1	0	0	66	35
Total	133	79	46	32	20	11	4	5	3	1	206	128

During the epidemic year 1940, 65.35 percent of the reported cases were among males and 34.65 percent among females. During the 11-year period 1930–40, 206 of the cases were among males and 128 among females, a percentage ratio of 62:38. Rosenau reports that on the average 56 percent of poliomyelitis cases are in males as compared to 44 percent in females.

CONCLUSION

Statistical material is presented showing the distribution of poliomyelitis in the Territory of Hawaii since 1922, with special reference to the outbreak during the fiscal year 1940. The data presented in this paper indicate the extent of the disease in the semitropics. As poliomyelitis is described as a disease of the temperate zones, this additional information, including the racial distribution, may throw light on some of the unsolved problems in the epidemiology of poliomyelitis.

No attempt has been made to describe the clinical characteristics of poliomyelitis in Hawaii as there appears to be little dissimilarity from cases reported elsewhere.

The racial distribution and the particularly high rates among the Caucasian population may be of interest in the epidemiology of the disease. This may be due to an increase in travel from the mainland to the Territory during this period.

Infantile paralysis in the Territory of Hawaii is definitely a public health problem, and with increasing migration to Hawaii its rate of occurrence is likely to increase.

REFERENCES

(*1*) Aycock, W. L.: The Epidemiology of Poliomyelitis. In Virus and Rickettsial Diseases. Harvard University Press, 1940.
(*2*) Dauer, C. E.: Studies on the epidemiology of poliomyelitis. Pub. Health Rep., **53**: 1003 (June 24, 1938).
(*3*) Lumsden, L. L.: Epidemiological Studies of Poliomyelitis in Kentucky. Public Health Bulletin No. 228, U. S. Government Printing Office, 1936.
(*4*) McKinley, E. B.: A Geography of Disease. George Washington University Press, 1935.
(*5*) Morales, E. Garrido: Acute anterior poliomyelitis at Vega Baja, Puerto Rico. J. Infect. Dis., **46**: 31 (January 1930).
(*6*) Rosenau, M. J.: Preventive Medicine and Hygiene. 6th Ed. D. Appleton Century Co., 1935.

REPORT ON MARKET-MILK SUPPLIES OF STANDARD MILK ORDINANCE COMMUNITIES [1]

Compliance of the Market-Milk Supplies of Certain Standard Milk Ordinance Communities With the Grade A Pasteurized and Grade A Raw Milk Requirements of the Public Health Service Milk Ordinance and Code, as Shown by Compliance (Not Safety) Ratings of 90 Percent or More Reported by the State Milk-Sanitation Authorities During the Period July 1, 1939, to June 30, 1941

The accompanying list gives the sixteenth semiannual revision of the list of certain Standard Milk Ordinance communities in which the pasteurized market milk is both produced and pasteurized in accordance with the Grade A pasteurized milk requirements of the Public Health Service Milk Ordinance and Code and in which the raw market milk sold to the final consumer is produced in accordance with the Grade A raw milk requirements of said ordinance and code, as shown by ratings of 90 percent or more reported by State milk-sanitation authorities.

These ratings are not a complete measure of safety, but represent the degree of compliance with the Grade A requirements of the Public Health Service Milk Ordinance and Code. Safety estimates should also take into account the percentage of milk pasteurized, which is given in the following tables.

The milk ordinance recommended by the Public Health Service is now in effect in hundreds of communities ranging in population from 1,000 to 3,500,000 and located in 34 States.

The primary reason for publishing the rating lists from time to time is to encourage these communities to attain and maintain a high level of excellence in the enforcement of this ordinance. No comparison with communities operating under other milk ordinances is intended or implied.

[1] From the States Relations Division.

It is emphasized that the Public Health Service does not intend to imply that only those communities on the list are provided with high-grade milk supplies. Some communities which have high-grade milk supplies are not included, because arrangements have not been made for the determination of their ratings by the State milk-sanitation authority. In other cases the ratings which have been determined are now more than 2 years old and have therefore lapsed. In still other communities with high-grade milk supplies there seems, in the opinion of the community, to be no local necessity nor desire for rating or inclusion in the list, nor any reasonable local benefit to be derived therefrom.

The rules under which a community is included in this list are as follows:

(1) All ratings must have been determined by the State milk-sanitation authority in accordance with the Public Health Service rating method (Pub. Health Rep., **53:** 1386 (1938). Reprint No. 1970), based upon the Grade A pasteurized milk and the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code.

(2) No community will be included in the list unless both its pasteurized milk and its raw milk ratings are 90 percent or more. Communities in which only raw milk is sold will be included if the raw milk ratings are 90 percent or more. Communities which receive, without local inspection, milk from other sheds will be included in the list only if the locally inspected supply, as well as the shipped-in supply, shows a rating of 90 percent or more.

(3) The rating used will be the latest rating submitted to the Public Health Service, but no rating will be used which is more than 2 years old. In order to promote continuous rigid enforcement rather than occasional "clean-up campaigns" it is suggested that when the rating of a community on the list falls below 90 percent no resurvey be made for at least 6 months, resulting in removal from the next semiannual list.

(4) The Public Health Service will make occasional check surveys of cities for which ratings of 90 percent or more have been reported by the State. If such check rating is less than 90 percent but not less than 85, the city will be removed from the 90-percent list after 6 months unless a resurvey submitted by the State during this probationary interim shows a rating of 90 percent or more. If, however, such check rating is less than 85 percent, the city will be removed from the list immediately. If the check rating is 90 percent or more, the city will be retained on the list for a period of 2 years from the date of the check survey unless a subsequent rating submitted during this period warrants its removal.

Communities are urgently advised to bring their ordinances up to date at least every 5 years, since ratings will be made on the basis of later editions if those adopted locally are more than 5 years old.

Communities which are not now on the list and desire to be rated should request the State milk-sanitation authority to determine their ratings and, if necessary, should improve their status sufficiently to merit inclusion in the list.

Communities which are now on the list should not permit their ratings to lapse, as ratings more than 2 years old cannot be used.

State milk-sanitation authorities who are not now equipped to determine municipal ratings are urged, in fairness to their communities, to equip themselves as soon as possible. The personnel required is small, as in most States one milk specialist is sufficient for the work.

The inclusion of a community in this list means that the pasteurized milk sold in the community, if any, is of such a degree of excellence that the weighted average of the percentages of compliance with the various items of sanitation required for Grade A pasteurized milk is 90 percent or more and that, similarly, the raw milk sold in the community, if any, so nearly meets the requirements that the weighted average of the percentages of compliance with the various items of sanitation required for Grade A raw milk is 90 percent or more. However, high-grade pasteurized milk is safer than high-grade raw milk, because of the added protection of pasteurization. To secure this added protection, those who are dependent on raw milk can pasteurize the milk at home in the following simple manner: Heat the milk over a hot flame to 165° F., stirring constantly; then immediately place the vessel in cold water and continue stirring until cool.

TABLE 1.—*Standard Milk Ordinance communities in which all market milk is pasteurized. In these communities market milk complies with the Grade A pasteurized milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by pasteurized milk ratings of 90 percent or more* [1]

Community	Percentage of milk pasteurized	Date of rating
ILLINOIS		
Aurora	100	May 3, 1940
Brooklyn	100	Mar. 22, 1940
Canteen	100	Do.
Centerville	100	Do.
East St. Louis	100	Do.
Elgin	100	July 12, 1940
Fairmont City	100	Mar. 22, 1940
National City	100	Do.
Stites	100	Do.
MINNESOTA		
Rochester	100	May 29, 1941
Winona	100	Sept. 1940
MISSOURI		
St. Louis	100	June 7, 1940
NORTH CAROLINA		
Clinton	100	June 5, 1940
Fort Bragg	100	June 4, 1940
Greenville	100	June 15, 1940
Sylva	100	May 10, 1940

[1] Note particularly the percentage of milk pasteurized in the various communities listed in these tables. This percentage is an important factor to consider in estimating the safety of a city's milk supply.

Table 2.—*Standard Milk Ordinance communities in which some market milk is pasteurized. In these communities the pasteurized market milk complies with the Grade A pasteurized milk requirements and the raw market milk complies with the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by pasteurized and raw milk ratings, respectively, of 90 percent or more* [1]

[Note.—All milk should be pasteurized or boiled, either commercially or at home, before it is consumed. See text for home method]

Community	Percentage of milk pasteurized	Date of rating
ALABAMA		
Dothan	84	June 23, 1941.
Tuscaloosa	86	May 24, 1940.
ARKANSAS		
El Dorado	39	June 1940.
Fayetteville	60	November 1940.
Fort Smith	48	September 1940.
Jonesboro	59	October 1940.
Little Rock	50	Do.
Osceola	42	January 1940.
Pine Bluff	25	June 1940.
Texarkana	47	September 1940.
COLORADO		
La Junta	27	March 1941.
Pueblo	59	April 1941.
FLORIDA		
Coral Gables	97	April 1940.
Dania	95	Mar. 28, 1940.
Deerfield	95	Do.
Fort Lauderdale	95	Do.
Hollywood	95	Do.
Jacksonville	78	April 1941.
Miami	97	April 1940.
Pompano	95	Mar. 28, 1940.
Tallahassee	38	August 1940.
GEORGIA		
Statesboro	40	Mar. 14, 1940.
ILLINOIS		
Chicago	99.8	Apr. 11, 1941.
Decatur	92	Oct. 3, 1940.
Evanston [2]	99.9	Apr. 17, 1940.
Glenco	99.8	Apr. 11, 1940.
Highland Park	99.8	Do.
Kenilworth	99.8	Do.
Lake Bluff	99.8	Do.
Lake Forest	99.8	Do.
Oak Park	99.8	Jan. 17, 1941.
Peoria	97	May 23, 1940.
Waukegan	99.9	Apr. 3, 1940.
Winnetka	99.8	Apr. 11, 1940.
KANSAS		
Chanute	40	May 1940.
Lawrence	69	Do.
Wellington	54	April 1940.
Wichita	75	December 1939.
KENTUCKY		
Bowling Green	68	June 12, 1941.
Henderson	45	June 11, 1940.
Lexington	66	September 1940.
Louisville	99.2	November 1940.
Paducah	83	February 1941.
Richmond	28	Jan. 14, 1941.
Somerset	9	November 1940.
LOUISIANA		
Monroe	41	Mar. 7, 1941.
MICHIGAN		
Crystal City	41	July 24, 1940.
Iron River	51	Do.
Stambaugh	51	Do.
MINNESOTA		
Moorhead	88	Feb. 14, 1941.
MISSOURI		
Clayton	([3])	Dec. 14, 1939.
Ferguson	([3])	Do.
Glendale	([3])	Do.
Kirkwood	([3])	Do.
Maplewood	([3])	June 7, 1940.
University City	([3])	Dec. 14, 1939.
Webster Groves	([3])	Do.
NEW MEXICO		
Albuquerque	72	Nov. 30, 1940.
Las Vegas	65	July 25, 1939.
Roswell	77	Aug. 8, 1939.
Santa Fe	44	December 1939.
NORTH CAROLINA		
Asheville	66	June 14, 1940.
Black Mountain	24	May 21, 1940.
Durham	91	October 1940.
Fayetteville	55	June 4, 1940.
Franklin	85	July 19, 1939.
Greensboro	86	August 1940.
Goldsboro	62	June 5, 1940.
Hendersonville	73	June 26, 1940.
Hope Mills	25	June 4, 1940.
Kinston	12	July 9, 1940.
Lumberton	36	May 29, 1940.
Mars Hill	15	Jan. 10, 1941.
Rockingham	53	Apr. 9, 1940.
Roxboro	36	July 2, 1940.
Tryon	49	July 24, 1939.
Waynesville	60	May 9, 1940.
Weaverville	40	June 5, 1940.
Winston-Salem	78	November 1939.
NORTH DAKOTA		
Fargo	90.8	Feb. 16, 1941.
Valley City	23	Nov. 10, 1939.
OHIO		
Athens	80	July 6, 1940.
OKLAHOMA		
Ada	55	June 27, 1940.
Bartlesville	45	Dec. 19, 1939.
Blackwell	35	Nov. 28, 1939.
Muskogee	82	June 4, 1940.
Okmulgee	60	July 22, 1940.
Seminole	63	Mar. 26, 1940.
Tulsa	74	Apr. 6, 1940.
Wewoka	52	July 8, 1940.

See footnotes at end of table.

TABLE 2.—*Standard Milk Ordinance communities in which some market milk is pasteurized. In these communities the pasteurized market milk complies with the Grade A pasteurized milk requirements and the raw market milk complies with the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by pasteurized and raw milk ratings, respectively, of 90 percent or more*—Continued

Community	Percentage of milk pasteurized	Date of rating	Community	Percentage of milk pasteurized	Date of rating
OREGON			TEXAS—continued		
Astoria	78	June 20, 1941.	San Antonio	82	June 28, 1940.
Eugene	60	Nov. 1, 1940.	Seguin	19	Dec. 11, 1940.
Portland	82	Apr. 3. 1940.	Sherman	53	Mar. 25, 1941.
Seaside	68	June 20, 1941.	Texarkana	45	Feb. 4, 1941.
SOUTH CAROLINA			Tyler	42	June 12, 1940.
Walterboro	26	Dec. 6, 1939.	UTAH		
TENNESSEE			Salt Lake City	96	Dec. 24, 1940.
Bristol	69	July 14, 1939.	VIRGINIA		
Memphis	90	December 1940.	Abingdon	38	Mar. 21, 1941.
TEXAS			Bristol	69	July 14, 1939.
Amarillo	78	Aug. 12, 1940.	Lexington	41	Oct. 26, 1939.
Big Spring	53	Aug. 8, 1940.	Pulaski	77	Sept. 20, 1939.
Brownwood	64	May 31, 1941.	South Boston	75	May 29, 1941.
Bryan	14	July 20, 1940.	Waynesboro	95	Oct. 11, 1939.
Canyon	42	Aug. 9, 1940.	Williamsburg	55	May 26, 1941.
Crystal City	39	June 27, 1940.	WASHINGTON		
Dallas	85	Dec. 7, 1940.	Camas	6	June 18, 1941.
Fort Worth	82	June 19, 1941.	Vancouver	28	Nov. 28, 1940.
Jacksonville	85	May 2, 1940.	Walla Walla	61	May 28, 1941.
Kerrville	74	Sept. 6, 1939.	Yakima	72	May 14, 1941.
Lamesa	47	Mar. 26, 1941.	WYOMING		
Lubbock	76	Oct. 28, 1939.	Casper	61	Nov. 15, 1940.
Lufkin	43	Aug. 1, 1940.	Cheyenne	66	Oct. 20, 1940.
Palestine	23	Jan. 30, 1940.			
San Angelo	65	May 13, 1940.			

[1] Note particularly the percentage of milk pasteurized in the various communities listed in these tables. This percentage is an important factor to consider in estimating the safety of a city's milk supply.
[2] Has not adopted the milk ordinance recommended by the Public Health Service.
[3] The percentage of the total milk supply pasteurized cannot be accurately determined owing to the overlapping of milk routes.

402837°—41——3

TABLE 3.—*Standard Milk Ordinance communities in which no market milk is pasteurized, but in which the raw market milk complies with the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by raw milk ratings of 90 percent or more* [1]

[NOTE.—All milk should be pasteurized or boiled, either commercially or at home, before it is consumed. See text for home method]

Community	Date of rating
ALABAMA	
Bridgeport	May 27, 1941.
Demopolis	Oct. 23, 1940.
Lanett	Mar. 19, 1940.
Scottsboro	May 27, 1941.
Stevenson	Do.
FLORIDA	
Apalachicola	January 1940.
KANSAS	
Horton	June 1940.
MISSOURI	
Brentwood	June 7, 1940.
NORTH CAROLINA	
Angier	June 6, 1940.
Bethel	May 15, 1940.
Brevard	July 28, 1939.
Calypso	May 23, 1940.
Coats	June 6, 1940.
Dunn	Do.
Elkin	Sept. 18, 1939.
Erwin	June 6, 1940.
Faison	May 23, 1940.
Farmville	May 15, 1940.
Jackson	July 16, 1940.
Kenansville	May 23, 1940.
Lillington	June 6, 1940.
NORTH CAROLINA—con.	
Mount Olive	June 5, 1940.
Murfreesboro	July 17, 1940.
Parmele	June 20, 1940.
Raeford	May 20, 1940.
Red Springs	May 29, 1940.
Rich Square	July 16, 1940.
Robersonville	June 20, 1940.
Rosehill	May 23, 1940.
Scotland Neck	July 16, 1940.
Wallace	May 23, 1940.
Warsaw	Do.
Weldon	July 16, 1940.
Williamston	June 20, 1940.
Winton	July 17, 1940.
SOUTH CAROLINA	
Hartsville	Nov. 9, 1939.
TEXAS	
Colorado	Nov. 3, 1939.
Del Rio	June 29, 1940.
VIRGINIA	
Blackstone	May 29, 1941.
Boydton	Apr. 4, 1941.
WEST VIRGINIA	
Grantsville	May 12, 1941.

[1] Note particularly the percentage of milk pasteurized in the various communities listed in these tables This percentage is an important factor to consider in estimating the safety of a city's milk supply.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

June 15–July 12, 1941

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended July 12, 1941, the number reported for the corresponding period in 1940, and the median number for the years 1936–40.

DISEASES ABOVE MEDIAN PREVALENCE

Influenza.—A further decline in the number of cases of influenza was reported during the 4 weeks ended July 12, but the number of cases (3,471) was about 2.4 times the incidence recorded for the corresponding period in 1940 and also of the 1936–40 median, which is represented by the 1940 figure (1,452 cases). Texas in the West

South Central region and California in the Pacific region seemed to be mostly responsible for the relatively high incidence in those regions, while Arizona in the Mountain region and Virginia and South Carolina in the South Atlantic region placed those regions on a level slightly above the normal seasonal expectancy. For the country as a whole the current incidence is the highest recorded for this period in the 13 years for which these data are available.

Measles.—Measles also remained at a relatively high level, the current incidence (44,796 cases) being the highest recorded for this period in recent years. Each section of the country except the Pacific contributed to the high incidence of this disease, the increases over the normal seasonal incidence varying from 1.1 times the 1936–40 median in the New England region to 4.6 times the median in the South Atlantic region. In the Pacific region the number of cases was considerably below the seasonal average.

Meningococcus meningitis.—While the number of cases of meningococcus meningitis was considerably higher than the number reported for this period in 1940, the incidence for the country as a whole stood at about the normal seasonal level. More than 60 percent of the total cases were reported from 9 States, viz, New York, 22 cases; Maryland, 15; Massachusetts, 10; Georgia, 9; West Virginia, 8; and New Jersey, Virginia, Texas, and California, 7 cases each.

Poliomyelitis.—For the 4 weeks ended July 14, Georgia reported 91 cases of poliomyelitis; Alabama, 75; Florida, 42; California, 25; and South Carolina and Illinois, 21 cases each. More than 65 percent of the total number of cases (415) reported occurred in those 6 States. For the country as a whole the incidence was only about 40 percent above the 1936–40 median for this period, but in the South Atlantic region the number of cases (167) was more than 6 times the median, and in the East South Central region the number of cases (111) was almost 3 times the normal seasonal expectancy. In other regions the situation remained favorable, only about the normal seasonal incidence being reported. An increase in this disease is normally expected at this time of the year.

Whooping cough.—Whooping cough still maintained a comparatively high level. For the current period the reported cases totaled 16,568, as compared with approximately 13,000 cases in 1940 and a median of approximately 15,000 cases. Of the 9 geographic regions, the West North Central, South Atlantic, West South Central, Mountain, and Pacific regions reported excesses over the normal seasonal incidence, while the New England, Middle Atlantic, East North Central, and East South Central regions reported a relatively low incidence.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period June 15–July 12, 1941, the number for the corresponding period in 1940, and the median number of cases reported for the corresponding period, 1936–40

Division	Current period	1940	5-year median	Current period	1940	5-year median	Current period	1940	5-year median
	Diphtheria			Influenza [1]			Measles [2]		
United States	637	623	1,145	3,471	1,452	1,452	44,796	23,946	23,946
New England	15	11	23	4	8	7	4,468	5,202	3,929
Middle Atlantic	93	103	208	13	30	23	14,330	6,666	8,422
East North Central	117	114	235	101	160	136	11,255	5,810	5,810
West North Central	57	45	83	42	19	108	1,603	1,168	950
South Atlantic	119	80	164	622	546	339	7,845	967	1,694
East South Central	46	45	78	82	73	91	1,218	720	547
West South Central	89	82	141	1,118	373	380	1,795	1,035	859
Mountain	47	66	66	199	99	74	978	1,137	758
Pacific	54	77	94	1,290	144	95	1,304	1,241	1,942
	Meningococcus meningitis			Poliomyelitis			Scarlet fever		
United States	151	89	150	415	301	301	5,053	5,703	6,366
New England	11	1	5	2	5	6	519	435	649
Middle Atlantic	35	15	34	24	4	18	1,506	1,858	1,858
East North Central	12	15	25	33	35	35	1,612	1,984	1,984
West North Central	6	6	12	17	30	13	345	366	510
South Atlantic	47	15	35	167	24	27	275	266	288
East South Central	14	14	38	111	16	41	211	181	135
West South Central	10	13	13	24	31	31	118	129	129
Mountain	4	2	3	6	9	9	132	128	217
Pacific	12	8	8	31	147	44	335	356	450
	Smallpox			Typhoid and paratyphoid fever			Whooping cough [2]		
United States	84	158	479	843	857	1,369	16,568	13,121	[3] 15,178
New England	0	0	0	21	22	22	941	794	990
Middle Atlantic	0	0	0	74	89	95	2,640	2,621	3,965
East North Central	28	36	104	109	78	100	3,182	2,702	4,117
West North Central	26	71	188	36	58	58	1,418	725	725
South Atlantic	1	3	4	163	188	415	2,503	1,887	2,298
East South Central	6	11	11	123	98	267	581	534	619
West South Central	4	21	21	256	256	348	1,568	1,453	1,453
Mountain	8	10	81	32	26	54	1,352	844	844
Pacific	11	6	60	29	42	53	2,383	1,561	1,276

[1] Mississippi, New York, and Pennsylvania excluded; New York City included.
[2] Mississippi excluded.
[3] 3-year (1938–40) median.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—The diphtheria incidence during the 4 weeks ended July 12 was slightly higher than during the corresponding period in 1940, but the number of cases reported (637) was only about 55 percent of the 1936–40 median figure for this period. The West North Central and South Atlantic regions reported significant increases over last year, while in the New England and South Central regions the current figures closely approximated those of 1940; in the Middle Atlantic, Mountain, and Pacific regions the disease was considerably less prevalent. In each region, however, the number of cases was lower than the average incidence for this period.

Scarlet fever.—For the current period there were 5,053 cases of scarlet fever reported, as compared with 5,703, 4,702, and 6,366 cases for the corresponding period in the years 1940, 1939, and 1938, respectively. The relatively high incidence in the East South Central region was due largely to an unusually high incidence in Kentucky, 110 cases, as compared with an average of approximately 50 cases for the corresponding period in the 5 preceding years. The numbers of cases reported from all other regions were comparatively low.

Smallpox.—The incidence of smallpox was also low. For the current period there were 84 cases reported, about 50 percent of the number reported for this period in 1940 and less than 20 percent of the normal seasonal expectancy. For the country as a whole, as well as for most of the geographic regions, the current incidence was the lowest on record for this period.

Typhoid fever.—The number of cases (843) of typhoid fever was only slightly lower than the number reported for this period in 1940, but it was less than 50 percent of the preceding 5-year average incidence. The situation was favorable in all sections of the country, each section except the East North Central, where only a slight increase occurred, reporting a relatively low incidence.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ended July 12, based on data received from the Bureau of the Census, was 11.0 per 1,000 inhabitants. This rate represented a slight increase over the average rate of 10.5 for the corresponding period in the 3 preceding years.

DEATHS DURING WEEK ENDED JULY 19, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended July 19, 1941	Corresponding week, 1940
Data from 87 large cities of the United States:		
Total deaths	7,218	7,468
Average for 3 prior years	7,308	
Total deaths, first 29 weeks of year	253,123	253,035
Deaths per 1,000 population, first 29 weeks of year, annual rate	12.2	12.2
Deaths under 1 year of age	496	464
Average for 3 prior years	485	
Deaths under 1 year of age, first 29 weeks of year	15,163	14,533
Data from industrial insurance companies:		
Policies in force	64,382,355	65,106,173
Number of death claims	11,973	10,834
Death claims per 1,000 policies in force, annual rate	9.7	8.7
Death claims per 1,000 policies, first 29 weeks of year, annual rate	10.0	10.1

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JULY 26, 1941

Summary

A total of 302 cases of poliomyelitis was reported for the current week, as compared with 246 for the preceding week. Seventy percent of these cases occurred in the South Atlantic and East South Central States, where Georgia, with 79 cases, and Alabama, with 58, reported 45 percent of the total for the week. Slight increases were recorded for some of the northern States, and increased incidence was shown for all geographic areas except the South Atlantic. The largest number of cases reported in the northern States was 11 each for New York (4 in New York City) and Ohio (8 in Cleveland).

Sixty-five cases of encephalitis were reported in North Dakota, making a total of 121 cases since July 1.

Of 73 cases of endemic typhus fever, 23 were reported in Georgia, 18 in Texas, 8 in Alabama, 7 in Oklahoma, 6 in Florida, and 5 in New York City. A total of 906 cases has been reported this year to date, as compared with 731 for the corresponding period last year and 1,224 for the same period in 1939. The highest incidence of the disease is recorded for the last six months of the year.

Of 19 cases of Rocky Mountain spotted fever reported during the week, 11 occurred in the States east of the Rocky Mountains and 8 cases in the Mountain and Pacific States. The total to date is 327 as compared with 254 cases for the same period last year.

The death rate for the current week for 88 large cities in the United States is 10.6 per 1,000 population, as compared with 10.1 for the preceding week and with a 3-year (1938–40) average of 10.7. The cumulative rate to date is 12.2, the same as for the corresponding period of last year.

Telegraphic morbidity reports from State health officers for the week ended July 26, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40	Week ended		Median 1936-40
	July 26, 1941	July 27, 1940		July 26, 1941	July 27, 1940		July 26, 1941	July 27, 1940		July 26, 1941	July 27, 1940	
NEW ENG.												
Maine	0	0	0	------	------	------	29	44	23	0	0	0
New Hampshire	0	0	0	------	------	------	3	0	2	0	0	0
Vermont	0	2	0	------	------	------	32	9	9	0	0	0
Massachusetts	2	1	2	------	------	------	178	391	106	2	1	1
Rhode Island	3	0	0	------	------	------	10	31	6	0	0	0
Connecticut	0	1	2	------	2	1	72	16	18	0	0	0
MID. ATL.												
New York [1]	7	10	16	[2] 4	[2] 4	[2] 3	355	561	354	5	5	5
New Jersey [3]	0	6	6	2	------	1	183	290	125	0	0	0
Pennsylvania	2	8	10	------	------	------	364	170	170	1	2	4
E. NO. CEN.												
Ohio	5	4	5	1	2	5	195	21	50	1	0	0
Indiana	2	11	9	8	3	3	27	12	8	0	1	1
Illinois	17	17	20	------	6	6	77	104	36	0	1	3
Michigan [4]	1	0	7	------	------	------	133	366	128	0	1	1
Wisconsin	0	1	0	6	6	9	280	356	73	3	0	0
W. NO. CEN.												
Minnesota	0	0	0	2	1	1	10	13	13	0	0	0
Iowa	1	2	4	1	------	------	34	28	20	0	1	0
Missouri [3]	2	2	2	2	------	6	32	8	8	0	2	1
North Dakota [3]	3	18	1	------	------	------	14	3	3	0	1	0
South Dakota [3]	1	0	1	------	------	------	2	4	1	0	0	0
Nebraska	1	0	0	------	------	------	11	8	5	0	0	0
Kansas	4	1	2	2	4	2	28	33	13	1	1	1
SO. ATL.												
Delaware	0	0	0	------	------	------	2	2	2	0	0	0
Maryland [3,4]	1	1	8	1	------	1	147	2	11	2	0	0
Dist. of Col.[3]	0	2	2	------	------	------	14	2	6	0	1	1
Virginia [1,3]	6	3	4	52	25	------	142	35	55	1	1	1
West Virginia [4]	3	1	4	1	5	5	55	7	7	1	3	2
North Carolina [3]	7	8	14	------	------	------	18	21	27	0	0	0
South Carolina [1]	1	4	4	92	87	66	76	2	2	2	1	1
Georgia [1,3]	4	8	10	11	21	------	36	4	------	0	0	0
Florida [1]	6	1	3	16	1	1	17	1	1	0	0	0
E. SO. CEN.												
Kentucky	3	1	5	------	------	2	45	40	27	1	0	3
Tennessee [3]	1	1	4	16	13	7	48	17	16	0	0	1
Alabama [1]	5	4	12	3	3	3	32	51	18	3	6	4
Mississippi [1,4]	3	2	9	------	------	------	------	------	------	0	0	0
W. SO. CEN.												
Arkansas	0	1	3	5	23	7	27	1	2	0	0	0
Louisiana [1]	2	4	7	------	2	6	0	3	3	1	0	0
Oklahoma	2	2	3	7	8	7	20	8	8	0	0	0
Texas [1]	22	19	17	348	183	51	103	90	37	0	1	1
MOUNTAIN												
Montana	0	0	0	------	------	------	3	11	11	0	0	0
Idaho	0	0	1	------	------	2	2	4	4	0	0	0
Wyoming [3]	2	0	0	5	------	------	2	5	5	1	0	0
Colorado [3]	13	10	6	14	2	------	30	10	14	0	0	0
New Mexico	0	0	3	1	------	------	31	16	16	0	0	0
Arizona	3	0	0	23	23	15	69	36	20	0	0	0
Utah [4]	0	0	0	1	------	------	6	31	22	0	0	0
Nevada	0	------	------	------	------	------	2	------	------	0	------	------
PACIFIC												
Washington[3]	1	3	1	1	------	------	5	11	16	0	0	0
Oregon[3]	1	1	0	1	1	8	18	33	15	0	1	0
California [1,3]	4	19	19	[6] 179	11	10	333	88	155	2	4	4
Total	141	179	278	805	436	266	3,352	2,999	2,170	27	34	34
30 weeks	7,123	8,371	12,811	597,895	167,969	150,757	825,027	223,679	267,442	1,328	1,094	2,039

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended July 26, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40	Week ended		Median 1936–40
	July 26, 1941	July 27, 1940		July 26, 1941	July 27, 1940		July 26, 1941	July 27, 1940		July 26, 1941	July 27, 1940	
NEW ENG.												
Maine	0	0	0	4	2	4	0	0	0	2	6	2
New Hampshire	0	0	0	2	1	1	0	0	0	1	0	0
Vermont	0	0	0	0	0	2	0	0	0	3	0	0
Massachusetts	2	0	2	49	30	32	0	0	0	1	1	3
Rhode Island	0	0	0	3	0	2	0	0	0	0	0	1
Connecticut	2	0	1	7	6	9	0	0	0	1	1	3
MID. ATL.												
New York [1]	11	6	6	70	92	92	0	0	0	12	4	12
New Jersey [3]	2	3	3	25	50	23	0	0	0	3	5	5
Pennsylvania	8	0	3	38	76	72	0	0	0	10	8	10
E. NO. CEN.												
Ohio	11	7	5	49	38	55	1	0	1	4	6	7
Indiana	8	13	2	15	17	21	0	0	6	2	6	6
Illinois	4	4	7	55	87	80	0	0	4	15	7	18
Michigan [4]	7	7	7	53	50	76	0	0	1	2	7	5
Wisconsin	0	1	0	33	36	54	0	0	1	0	0	1
W. NO. CEN.												
Minnesota	5	0	0	12	12	25	0	6	6	0	2	0
Iowa	3	2	1	14	5	18	0	3	7	2	1	4
Missouri [3]	0	0	1	55	18	13	0	0	4	5	30	15
North Dakota [3]	0	0	0	1	1	3	0	1	1	0	0	1
South Dakota [3]	0	1	0	1	1	6	0	1	1	0	0	0
Nebraska	2	0	0	6	1	3	0	0	0	1	0	0
Kansas	0	8	3	20	15	23	1	0	0	2	5	5
SO. ATL.												
Delaware	0	0	0	4	2	2	0	0	0	0	0	0
Maryland [3 4]	3	0	0	9	5	10	0	0	0	0	1	5
Dist. of Col. [3]	1	0	0	3	4	4	0	0	0	0	0	2
Virginia [1 3]	3	3	3	10	13	11	0	0	0	8	7	23
West Virginia [4]	1	6	1	8	7	11	1	0	0	10	11	11
North Carolina [3]	5	1	2	3	5	15	0	0	0	7	6	21
South Carolina [1]	5	0	1	3	6	2	1	0	0	12	11	15
Georgia [1 3]	79	1	2	3	7	7	0	0	0	13	38	38
Florida [1]	16	1	1	3	0	1	0	0	0	13	1	1
E. SO. CEN.												
Kentucky	11	0	2	20	5	9	0	0	0	8	21	37
Tennessee [3]	24	0	2	17	12	12	0	2	0	21	9	28
Alabama [1]	58	2	2	10	11	10	0	1	0	9	9	18
Mississippi [1 4]	10	1	1	1	6	4	0	0	0	7	11	15
W. SO. CEN.												
Arkansas	2	0	1	1	1	4	0	0	0	14	36	36
Louisiana [1]	2	8	3	7	4	4	0	0	0	14	38	37
Oklahoma	1	6	3	6	13	7	0	0	0	9	20	32
Texas [1]	3	10	10	14	15	16	0	0	0	38	43	67
MOUNTAIN												
Montana	1	1	0	10	4	10	0	0	2	0	0	2
Idaho	0	3	0	4	2	2	0	0	2	0	1	1
Wyoming [3]	1	1	0	1	3	3	0	0	0	0	1	0
Colorado [3]	0	0	0	4	12	11	1	3	1	5	2	4
New Mexico	1	1	0	0	2	3	0	0	0	3	7	6
Arizona	0	0	0	1	2	2	1	0	0	1	4	3
Utah [4]	1	2	0	1	4	5	0	0	0	9	1	1
Nevada	0			0			0			0		
PACIFIC												
Washington [3]	0	18	0	8	15	14	0	0	2	1	4	3
Oregon [3]	0	4	1	4	3	6	0	4	4	1	6	5
California [1 3]	9	18	18	35	45	56	0	0	9	8	8	13
Total	302	139	139	702	746	884	6	21	76	277	385	534
30 weeks	1,525	1,206	1,206	90,109	116,998	134,728	1,167	1,893	7,795	3,512	3,829	5,599

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended July 26, 1941, and comparison with corresponding week of 1940—Con.

Division and State	Whooping cough, Week ended— July 26, 1941	Whooping cough, Week ended— July 27, 1940	Division and State	Whooping cough, Week ended— July 26, 1941	Whooping cough, Week ended— July 27, 1940
NEW ENG.			SO. ATL.—continued		
Maine	30	25	South Carolina [1]	100	19
New Hampshire	7	0	Georgia [1 3]	44	11
Vermont	1	16	Florida [1]	28	0
Massachusetts	131	126	E. SO. CEN.		
Rhode Island	44	5	Kentucky	72	78
Connecticut	57	63	Tennessee [3]	76	65
MID. ATL.			Alabama [1]	26	23
New York [1]	279	321	Mississippi [1 4]		
New Jersey [3]	115	114	W. SO. CEN.		
Pennsylvania	322	322	Arkansas	4	23
E. NO. CEN.			Louisiana [1]	4	14
Ohio	326	306	Oklahoma	18	17
Indiana	27	16	Texas [1]	190	244
Illinois	146	135	MOUNTAIN		
Michigan [4]	234	310	Montana	6	0
Wisconsin	186	106	Idaho	10	11
W. NO. CEN.			Wyoming [3]	14	10
Minnesota	40	46	Colorado [3]	113	17
Iowa	25	31	New Mexico	19	26
Missouri [3]	22	51	Arizona	25	7
North Dakota [5]	17	7	Utah [4]	82	78
South Dakota [3]	11	5	Nevada	1	
Nebraska	19	16	PACIFIC		
Kansas	117	71	Washington [3]	84	36
SO. ATL.			Oregon [3]	34	15
Delaware	1	7	California [1 3]	435	297
Maryland [3 4]	76	143			
Dist. of Col.[3]	12	17			
Virginia [1 3]	46	55	Total	3,889	3,471
West Virginia [4]	29	63			
North Carolina [3]	184	103	30 weeks	135,672	96,902

[1] Typhus fever week ended July 26, 1941, 73 cases as follows: New York, 5; Virginia, 1; South Carolina, 2 Georgia, 23; Florida, 6; Alabama, 8; Mississippi, 1; Louisiana, 7; Texas, 18; California, 2.
[2] New York City only.
[3] Rocky Mountain spotted fever, week ended July 26, 1941, 19 cases as follows: New Jersey, 1; Missouri, 1; South Dakota, 1; Maryland, 1; District of Columbia, 1; Virginia, 2; North Carolina, 1; Georgia, 1; Tennessee, 2; Wyoming, 4; Colorado, 1; Washington, 1; Oregon, 1; California, 1.
[4] Period ended earlier than Saturday.
[5] Encephalitis, week ended July 26, 1941: North Dakota, 65.
[6] Delayed report of 152 cases included.

PLAGUE INFECTION IN GROUND SQUIRRELS AND FLEAS IN KERN COUNTY, CALIF.

Under date of July 18, 1941, Dr. Bertram P. Brown, State Director of Public Health of California, reported plague infection proved in ground squirrels and fleas from ground squirrels, all *C. beecheyi*, in Kern County, Calif., as follows:

In 2 ground squirrels, 1 submitted to the laboratory on June 24 and the other taken on June 28, both from a ranch at Keene; in 2 pools of fleas submitted to the laboratory on June 24 from the same ranch, 1 a pool of 1,139 fleas from 68 ground squirrels, and the other of 200 fleas from 7 ground squirrels; in a pool of 239 fleas from 31 ground squirrels submitted to the laboratory on June 20 from a location 5 miles west and 1 mile south of Democrat Springs.

WEEKLY REPORTS FROM CITIES

City reports for week ended July 12, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showng a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	83	25	11	1,298	284	415	6	349	47	1,335	--------
Current week [1]	42	36	11	1,416	219	323	0	338	33	1,356	--------
Maine:											
Portland	0	------	0	0	2	0	0	0	0	0	24
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	5
Nashua	0	------	0	0	0	0	0	0	0	1	5
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	1	0	0	0	0	0	0	9
Rutland	0	------	0	0	1	0	0	0	0	0	6
Massachusetts:											
Boston	0	------	1	79	1	19	0	8	0	22	186
Fall River	0	------	0	1	0	2	0	1	0	5	25
Springfield	0	2	0	24	0	5	0	0	1	5	25
Worcester	0	------	0	3	1	3	0	4	0	1	30
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	19
Providence	1	------	0	9	0	0	0	0	1	12	59
Connecticut:											
Bridgeport	0	------	0	26	0	0	0	2	0	1	21
Hartford	0	------	0	7	0	1	0	2	0	2	41
New Haven	0	------	0	1	1	0	0	0	0	1	29
New York:											
Buffalo	0	------	0	14	6	4	0	2	0	12	126
New York	13	3	0	122	51	49	0	71	3	118	1,205
Rochester	0	------	0	34	1	0	0	0	0	13	60
Syracuse	0	------	0	18	4	2	0	1	0	18	40
New Jersey:											
Camden	0	------	0	2	1	0	0	1	0	7	33
Newark	1	------	0	22	1	2	0	3	0	15	90
Trenton	0	------	0	11	2	1	0	2	0	0	47
Pennsylvania:											
Philadelphia	2	------	0	36	17	22	0	22	2	34	434
Pittsburgh	0	------	0	134	5	6	0	7	2	66	147
Reading	0	------	0	7	0	0	0	0	0	0	27
Scranton	0	------	--------	17	--------	0	0	--------	0	0	--------
Ohio:											
Cincinnati	4	------	0	0	0	2	0	8	0	5	171
Cleveland	0	1	0	8	6	13	0	9	0	88	188
Columbus	0	1	1	17	2	5	0	5	0	31	124
Toledo	0	3	0	134	0	1	0	5	0	31	77
Indiana:											
Anderson	0	------	0	1	0	0	0	1	0	0	10
Fort Wayne	0	------	0	0	1	0	0	0	2	1	27
Indianapolis	0	------	0	7	5	1	0	5	0	4	124
South Bend	------	------	------	------	------	------	------	------	------	------	------
Terre Haute	0	------	0	1	0	1	0	0	0	0	13
Illinois:											
Alton	0	------	0	6	0	0	0	0	0	1	9
Chicago	7	3	2	29	15	39	0	35	1	60	601
Elgin	0	------	0	3	1	0	0	1	0	6	8
Moline	0	------	0	3	0	0	0	0	0	4	--------
Springfield	0	------	0	11	1	2	0	0	0	0	20
Michigan:											
Detroit	2	------	1	78	9	33	0	10	0	79	271
Flint	0	------	0	7	2	2	0	0	0	2	26
Grand Rapids	0	------	0	21	0	3	0	0	0	6	34
Wisconsin:											
Kenosha	0	------	0	3	0	0	0	0	0	0	7
Madison	6	------	0	13	0	0	0	0	0	4	23
Milwaukee	0	------	0	203	2	12	0	5	0	78	103
Racine	0	------	0	21	0	2	0	1	0	13	8
Superior	0	------	0	1	0	0	0	0	0	6	11

[1] Figures for Barre and South Bend estimated; reports not received.

City reports for week ended July 12, 1941

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	0	0	0	0	1	0	27	20
Minneapolis	0	------	0	5	2	2	0	0	0	21	74
St. Paul	0	------	0	1	1	3	0	0	0	14	64
Iowa:											
Cedar Rapids	0	------	------	0	------	0	0	------	0	1	------
Davenport	0	------	------	0	------	0	0	------	0	0	------
Des Moines	0	------	------	6	------	2	0	------	0	6	26
Waterloo	0	------	------	3	------	0	0	------	0	1	------
Missouri:											
Kansas City	0	------	0	18	4	6	0	2	0	12	81
St. Joseph	0	------	0	0	1	1	0	0	0	0	26
St. Louis	1	------	0	37	7	4	0	6	2	46	222
North Dakota:											
Fargo	0	------	0	0	0	0	0	0	0	3	8
Grand Forks	0	------	------	0	------	0	0	------	0	0	------
Minot	0	------	------	3	------	0	0	------	0	1	4
South Dakota:											
Aberdeen	0	------	------	1	------	1	0	------	0	0	------
Sioux Falls	0	------	------	0	------	0	0	------	0	0	10
Nebraska:											
Lincoln	0	------	------	2	------	1	0	------	0	2	------
Omaha	0	------	3	5	0	5	0	1	0	0	68
Kansas:											
Lawrence	0	------	0	1	0	0	0	0	0	1	11
Topeka	0	------	0	4	1	0	0	0	0	25	7
Wichita	0	------	0	3	5	3	0	0	0	10	35
Delaware:											
Wilmington	0	------	0	1	2	3	0	0	0	0	29
Maryland:											
Baltimore	0	------	0	186	5	8	0	14	1	58	194
Cumberland	0	------	0	2	0	0	0	0	0	0	16
Frederick	0	------	0	0	0	0	0	0	0	0	2
Dist. of Col.:											
Washington	0	------	0	37	6	3	0	6	0	1	146
Virginia:											
Lynchburg	0	------	0	32	0	0	0	0	0	5	10
Norfolk	0	------	0	1	0	0	0	0	0	1	20
Richmond	0	------	0	7	1	2	0	1	1	0	32
Roanoke	0	------	0	3	0	0	0	1	0	0	16
West Virginia:											
Charleston	0	------	0	0	1	0	0	0	0	0	7
Huntington	0	------	------	0	------	0	0	------	1	0	------
Wheeling	0	------	0	13	0	0	0	1	0	6	18
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	0	------
Raleigh	0	------	0	3	1	0	0	1	0	12	12
Wilmington	1	------	0	5	0	0	0	0	0	35	10
Winston-Salem	0	------	0	9	0	0	0	1	0	2	16
South Carolina:											
Charleston	0	1	0	0	1	0	0	0	2	1	18
Florence	0	1	0	2	3	0	0	0	0	5	19
Greenville	0	------	0	0	1	0	0	1	0	0	11
Georgia:											
Atlanta	0	2	0	3	2	3	0	5	1	1	95
Brunswick	0	------	0	0	0	0	0	0	0	0	1
Savannah	0	------	0	5	2	0	0	1	0	0	28
Florida:											
Miami	0	2	0	1	0	0	0	3	1	2	26
St. Petersburg	0	------	0	1	0	0	0	1	0	0	14
Tampa	0	------	0	0	1	0	0	1	0	1	31
Kentucky:											
Ashland	0	------	0	1	0	0	0	0	0	3	8
Covington	0	------	0	0	0	0	0	1	0	0	15
Lexington	0	------	0	0	0	0	0	0	0	6	13
Louisville	0	------	0	52	7	16	0	2	0	30	85
Tennessee:											
Knoxville	0	------	0	1	0	0	0	1	1	1	32
Memphis	0	8	0	5	0	1	0	4	3	2	88
Nashville	0	------	0	0	1	4	0	4	2	18	69
Alabama:											
Birmingham	0	1	0	3	1	0	0	6	2	8	72
Mobile	0	------	0	2	1	0	0	2	0	0	35
Montgomery	1	------	------	0	------	0	0	------	0	0	------
Arkansas:											
Fort Smith	0	------	------	0	------	0	0	------	0	0	------
Little Rock	0	------	0	3	2	0	0	0	0	2	30

City reports for week ended July 12, 1941

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0		0	0	0	0	0	0	0	0	5
New Orleans	1	1	0	0	0	5	0	11	5	25	125
Shreveport	1		0	0	2	1	0	7	0	0	50
Oklahoma:											
Oklahoma City	0		0	2	3	0	0	0	1	1	72
Tulsa	0		0	3	3	0	0	0	0	1	28
Texas:											
Dallas	1		0	11	0	0	0	2	0	0	66
Galveston	0		0	0	2	0	0	0	0	0	18
Houston	0		1	1	5	1	0	7	1	1	83
San Antonio	0	1	0	0	9	1	0	5	0	13	95
Montana:											
Billings	0		0	0	0	1	0	0	0	0	8
Great Falls	0		0	0	1	1	0	0	0	12	13
Helena	0		0	0	0	1	0	0	0	1	7
Missoula	0		0	0	0	0	0	0	0	0	4
Idaho:											
Boise	0		0	1	0	0	0	0	0	0	11
Colorado:											
Colorado Spgs	0		0	0	0	0	0	0	0	0	9
Denver	4	6	0	16	3	3	0	3	0	143	84
Pueblo	0		0	5	1	0	0	0	0	8	14
New Mexico:											
Albuquerque	0		0	0	0	0	0	1	0	0	7
Arizona:											
Phoenix	0	14		4		0	0		0	9	
Utah:											
Salt Lake City	0		0	3	0	4	0	0	0	23	38
Washington:											
Seattle	0		0	0	1	0	0	2	0	16	64
Spokane	0		0	2	0	0	0	0	0	3	31
Tacoma	0		0	0	0	1	0	0	0	22	39
Oregon:											
Portland	1		0	1	4	0	0	0	0	4	61
Salem	0			1		0	0		0	0	
California:											
Los Angeles	0	6	1	18	5	18	0	25	0	22	371
Sacramento	1		0	1	0	3	0	4	0	21	35
San Francisco	2		1	6	6	4	0	10	0	31	180

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
New York:				Maryland:			
New York	5	1	2	Baltimore	0	0	1
Pennsylvania:				Georgia:			
Philadelphia	1	1	1	Atlanta	0	0	11
Pittsburgh	1	0	0	Brunswick	0	0	1
Ohio:				Savannah	0	0	1
Cleveland	0	0	3	Florida:			
Illinois:				Miami	0	0	1
Chicago	0	0	1	Alabama:			
Minnesota:				Birmingham	0	0	6
Duluth	0	0	1	Louisiana:			
Missouri:				New Orleans	0	0	1
St. Louis	0	0	1	Oregon:			
North Dakota:				Portland	0	0	1
Fargo	0	0	1				

Encephalitis, epidemic or lethargic.—Cases: New York, 1; Pittsburgh, 2; Fargo, 19; Minot, 1. Deaths: New York, 1; Fargo, 1; Topeka, 1; Washington, D. C., 1; Oklahoma City, 1.

Pellagra.—Cases: Atlanta, 2; Savannah, 2; Montgomery, 1; San Antonio, 1.

Typhus fever.—Cases: New York, 1; Atlanta, 1; Mobile, 1; Shreveport, 4.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended June 21, 1941.—During the week ended June 21, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		4	2	4	7			1	2	20
Chickenpox		45		107	360	88	65	63	42	770
Diphtheria	2	22		22	5	6		1		58
Influenza		5			5					10
Measles		18		413	801	60	13	24	175	1,504
Mumps				112	142	30	25	6	5	320
Pneumonia		9			8				7	24
Poliomyelitis					2		1			3
Scarlet fever	4	13	1	109	145	9	3	17	13	314
Smallpox							1			1
Tuberculosis	3	24	12	71	39	34	10	1		194
Typhoid and paratyphoid fever			1	11	5			1		18
Whooping cough		4	1	55	164	2		9	54	289

Poliomyelitis epidemic in Manitoba.—Information received under date of July 25, 1941, reports an outbreak of poliomyelitis in the Province of Manitoba, Canada. A total of 101 cases, with 2 deaths, had been reported to the Provincial Bureau of Health since July 1. About 75 percent of the cases originated in Greater Winnipeg, while the remainder occurred in smaller municipalities in the immediate vicinity of the city.

The disease was reported to be of mild type. About 25 percent of the persons affected developed muscular weakness or paralysis. The cases were equally distributed between males and females, and the majority were in children 8 to 15 years of age.

CUBA

Provinces—Notifiable diseases—4 weeks ended June 21, 1941.—During the 4 weeks ended June 21, 1941, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana [1]	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer		1	2	10		17	30
Chickenpox		6	3	2		10	21
Diphtheria		16	1	1		8	26
Dysentery		1					1
Leprosy		2		1		2	5
Malaria	19	8		16		73	116
Measles			6	22	6		34
Scarlet fever		4					4
Tuberculosis	27	62	16	53	5	50	213
Typhoid fever	19	55	22	41	6	42	185
Whooping cough		2				2	4
Yaws						3	3

[1] Includes the city of Habana.

PORTUGAL

Notifiable diseases—Year 1940.—The following table shows the numbers of cases of certain notifiable diseases with deaths from the same causes in Portugal during the year 1940:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	181	94	Scarlet fever	509	17
Diphtheria	2,573	242	Smallpox	771	45
Lethargic encephalitis	14	4	Typhoid fever	5,594	532
Poliomyelitis	146	13	Typhus fever	1	1

NOTE.—Population, 1937: 6,877,000.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of July 25, 1941, pages 1531–1534. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Argentina.—Plague has been reported in Argentina as follows: February 1941, Cordoba Province, 1 case; March 1941, Santa Fe Province, 13 plague-infected rats; April 1941, Cordoba Province, 2 cases, 1 death; Santa Fe Province, 42 plague-infected rats; May 1941, Cordoba Province, 12 cases, 8 deaths, including 2 fatal cases of pneumonic plague; Santa Fe Province, 12 plague-infected rats; June 1941, Cordoba Province, 5 cases, 3 deaths, including 1 fatal case of pneumonic plague.

Canada.—Under date of July 14, 1941, Dr. R. E. Wodehouse, Deputy Minister of the Department of Pensions and National Health of Canada, reported plague infection proved bacteriologically on June 24 in a ground squirrel taken southeast of Stanmore, Alberta, about 180 miles north of the international boundary.

Typhus Fever

Bolivia.—Typhus fever has been reported in Bolivia as follows: January 1941, La Paz Department, 5 cases; Potosi Department, 2 cases; February 1941, La Paz Department, 2 cases; Oruro Department, 1 case; March 1941, Cochabamba Department, 3 cases; La Paz Department, 50 cases; Oruro Department, 4 cases; Potosi Department, 8 cases.

Yellow Fever

French Equatorial Africa—Gabon—Mayumba.—On June 18, 1941, 4 cases of yellow fever with 3 deaths were reported at Mayumba, Gabon, French Equatorial Africa.

Ivory Coast—Bingerville.—On July 12, 1941, 1 death from suspected yellow fever was reported in Bingerville, Ivory Coast.

×